SCIENTIFIC AMERICAN

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THE BROADWAY AND SEVENTH AVENUE CABLE ROAD.

The operations for converting the Broadway and Seventh Avenue street railroad of this city into a cable traction road are now under way. As this is the representative of a number of roads under the same administration, and as the work marks the first application of the cable system to railroads in the down town business districts of the city, the operations have a definite meaning. It marks the first step in making this a city of cable roads. The Third Avenue railroad company is committed to a cable system which may be in operation as soon as the Broadway and Seventh Avenue company complete their change. It is said that the Sixth Avenue railroad also propose making the same change. Then, by bringing associated lines under the system, the street car horse may, within a few years, be almost banished from our streets.

As yet the operations of installing the cable system are in a very early stage. Our illustrations show the work in progress and the difficulties that have to be contended with. Up to the present time the work has not reached the stage of actual construction. The contractors are only clearing the way for the introduction of the cable duct.

The first step in the work was executed by the railroad company, and was in the nature of reconnaissance or exploration. The road starts at the southern extremity of the city, and runs up Whitehall Street to Broadway. Thence following the line of Broadway, which is not a perfectly straight one, it goes obliquely through the city to Seventh Avenue, near 44th Street. Near this point Broadway and Seventh Avenue cross each other at an acute angle. Diverging slightly to the right, the road follows Seventh Avenue and continues to 59th Street, terminating at one of the entrances to Central Park. The entire length of the road is about five miles. To ascertain what work was necessary to clear the ground of obstructions, this entire line was examined. At every intersection of a cross street, one or two cross sections, showing the pipes, electrical conduits, etc., underlying the street, were prepared. Some of the data for these cross sections were obtained from any records that were found available. Such records were far from complete. The work done on the electric subway vaults or manholes furnished another source of information, but much of the data were determined only by actual digging.

In this way a great number of cross sections were determined. To illustrate the nature of the work, we reproduce one of such sections and show in the other cut what appearance the ground in the vicinity of the same cross section presented when excavated. The

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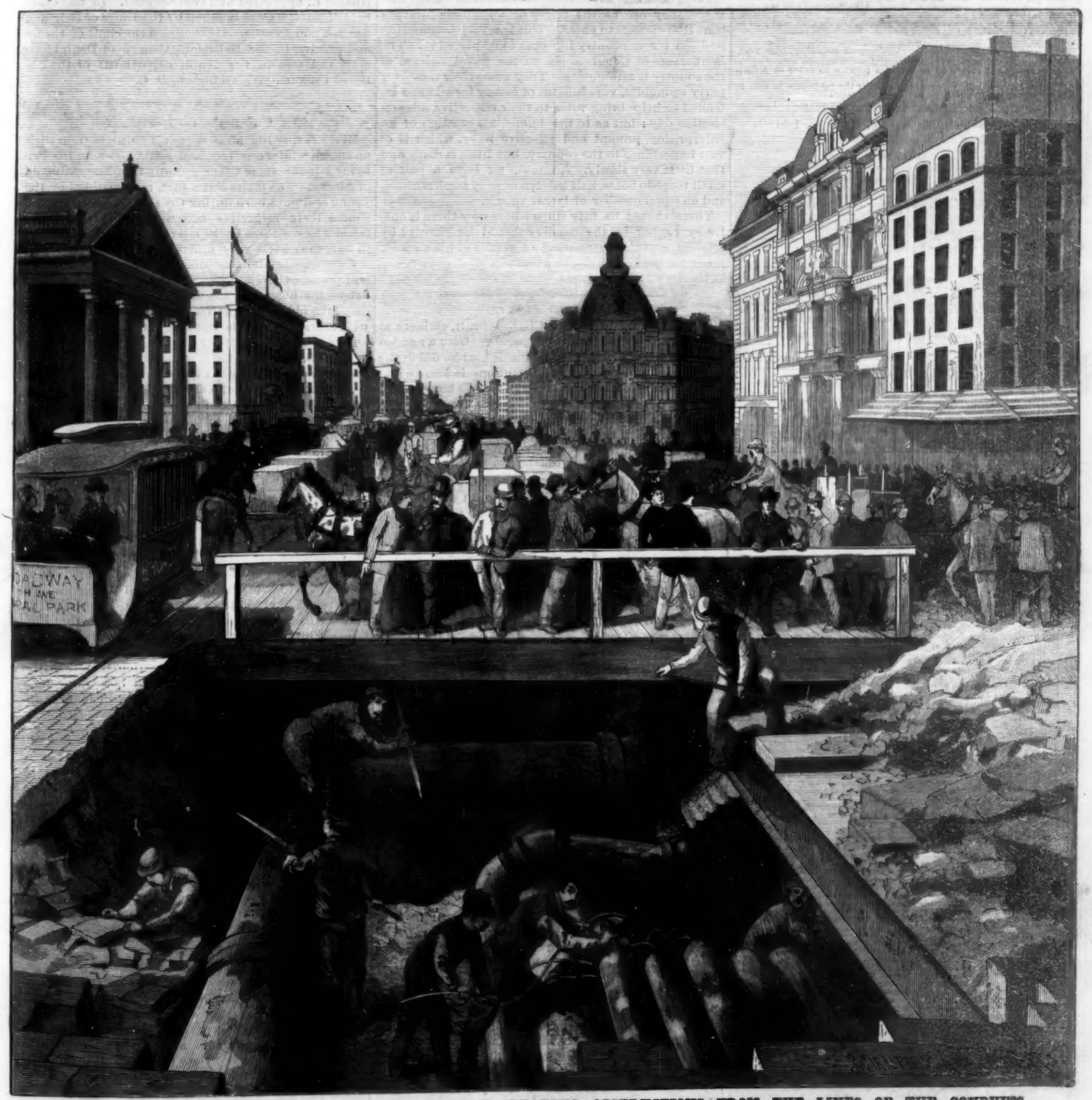

THE BROADWAY AND SEVENTH AVENUE RAILROAD—CLEARING OBSTRUCTIONS FROM THE LINES OF THE CONDUITS.

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DEFENSELESS CONDITION OF OUR SEAPORTS.

The need of fast war vessels was well illustrated by the recent incident in the harbor of San Diego, when a Chilian cruiser belonging to the insurgents entered the bay, anchored, took on board recruits, supplies of provisions, ammunition, and then sailed away. This ship, under the laws of nations, was in fact a piratical vessel, and as such was seized by the government authorities at San Diego, and a United States marshal placed on board in possession. But the Chilian rebels paid no attention to the laws of the United States; they may be said to have captured the place. When they had obtained all the supplies they wanted to assist them in carrying on war against a friendly nation, they upheaved anchor and steamed away, carrying off as a prisoner the official representative of the great republic. This was a small ship called the Itata, carrying four guns.

Report has it that the government is mildly indignant at this occurrence, and has ordered the United States war ship Charleston, at San Francisco, to sail in pursuit of the Itata and recapture her if possible. Allowing this could be done, and the Itata could be destroyed, it might be dangerous to attempt it. The Chilian rebels would be maddened and might retaliate. There is nothing to prevent them from sending in other boats to capture or bombard San Diego or other towns along the coast. Indeed, while the Itata was taking on supplies at San Diego, other vessels of the rebels were hovering outside the harbor.

We have no navy worthy of the name, and nearly all our seaports are without proper defenses. Like San Diego, they are at the mercy of any single piratical boat that chooses to enter. This is a very humiliating position for a country like ours to be placed in. The indifference of Congressmen to the naval defense of the country is astounding. They waste their time over party squabbles, vote billions of money for schemes intended to help bring votes to their respective sides on election day; but as to the immediate creation of an enterprising, prompt and effective navy, which is of vast importance to the country, but little is done, and that little very slowly. All told, we have a pair of small torpedo boats, half a dozen or so of small cruisers, and an equal number of larger vessels.

There should be fifty ships where now there is one. Every harbor in the country should be guarded by efficient sentinels consisting of vessels of high speed, ready for instant action, to maintain and enforce the authority of the republic.

CHARLES PRATT.

On the evening of May 4, Charles Pratt, eminent as a philanthropist of the best type, died from a sudden attack of heart disease. While much that he did in the endowment and support of institutions is known and has made him famous as one of the world's benefactors, a great deal of the good he performed was known to few besides himself. Thus it is said that his last business transaction before he died was the signing of a check, as a donation to the Brooklyn Board of Charities.

He was born in Wilbraham, Mass., October 2, 1830. At the age of 19 he engaged in the paint and oil business, beginning at the foot of the ladder. As one of ten children he was obliged to work for his own support, and succeeded so well that in 1857 he was able to come to this city and start as a member of the firm of Devoe, Reynolds & Pratt. This firm dealt in paints and oils. Soon afterward Mr. Pratt started on his own account in the refining of petroleum. His brand of kerosene, known as astral oil, is known everywhere. Later his firm was absorbed by the Standard Oil Company. Of the latter corporation Mr. Pratt was a leading member up to the day of his death.

His great wealth was devoted largely to the cause of education. The Adelphi Academy, of Brooklyn, N. Y., practically owns him as its father. He found it a private school, and by his donations, and advice and direction, brought it up to the standard of a high grade incorporated literary and scientific college. His donations to this cause exceed a quarter of a million of dollars. A few years ago the Pratt Institute, of Brooklyn, for manual training and scientific instruction generally, was opened to the public. This was entirely his creation. It is familiar to our readers, having been illustrated in this paper. Upon the Pratt Institute over one million of dollars was spent by its founder. Large additions to the Institute were contemplated, which it is to be hoped may yet be carried out.

Upon the principle of the Peabody buildings in London, Mr. Pratt established a large flat house in the Greenpoint district of Brooklyn. It is 200 by 135 feet in size and contains 120 suites of rooms upon its six floors. The building affords homes at moderate cost. It contains a reading room and library for the use of the occupants. The income derived from it was devoted to the maintenance of the Pratt Institute.

What other plans Mr. Pratt had in view for the future is uncertain. The work of his life is of double importance. It has brought about abiding and permanent good and has set a noble example for others to follow.

DR. EDWARD MAYNARD.

Dr. Edward Maynard died on May 3, aged 78 years. A dental surgeon by profession, he won a high standing among his co-practitioners. Some of his work is to-day a standard, and he introduced several new operations in dentistry. Originally a candidate for the West Point United States Military Academy, his delicate health prevented his completing the course. This episode presumably turned his mind to arms, and his reputation as an inventor of fire-arms became widely spead. In 1845 he patented the tape system of primers to take the place of the ever-troublesome percussion cap, an immense advance over the old system. In 1851 he invented the breech-loading rifle that bears his name, subsequently improved and patented at various dates, and forming one of the basic improvements in the development of the metallic cartridge breech-loader of to-day.

One interesting invention was for application to double-barreled guns, allowing each barrel to expand or contract independently of the other, thus preventing the expansion of one barrel when fired or when exposed to the sun from warping the other. As late as 1886 he patented an indicator for magazine rifles, to show at a glance the number of cartridges they contain.

Many other inventions in ammunition and fire-arms were made by him. He presented the interesting example of a man winning high eminence in two widely different fields of work. Various honors were offered him by foreign potentates. The Emperor of Russia, Nicolas I., appointed him court dentist. In the other field of work he was honored by the Kings of Belgium, Sweden and Prussia. He occupied the chair of theory and practice in the Baltimore College of Dental Surgery, and also in the dental department of the National University, Washington, D. C.

The Fur Seals in Behring Sea.

Every spring the seals appear in droves from their unknown winter quarters, and settle down on the Pribylov Islands, some 200 miles away from the mainland of Alaska. The males come first, accompanied by the young seal pups born during the previous summer, and choose their respective homes on the rocks. The females follow three weeks later—meek little creatures, in steel gray garb, very different from the big brown male seals, with their fighting propensities. Often one seal possesses twenty wives, and he has hard task to defend his home and family from his neighbors. Indeed, the old seals fight like furies, becoming covered with scars and terrible wounds, and sometimes losing an eye or part of a flipper in the fray. Most of the fighting is done with the mouth. The combatants approach each other with averted heads and sly looks, till suddenly they utter a shrill piping whistle, and engage with their sharp canine teeth, the hair flies and the blood flows amid much furious bellowing. The young bachelors—from one to five years old—herd together in their own quarters at a respectful distance, till they are strong enough to fight for wife and home.

A Deep Well.

Some time ago the Wheeling Development Company began drilling a well near Wheeling, W. Va., in search of petroleum or natural gas. The hole has now reached a depth of 4,100 feet. In this distance several veins of coal have been passed, and both oil and gas have been struck, but not in paying quantities. The hole is 8 inches in diameter. It is reported that Professor White, State geologist of West Virginia, has succeeded in interesting the officers of the United States Geological Survey in the exploration, and that the hole is to be continued to a depth of 1,000 feet more, or as far as is practicable, with the idea of making investigations of temperature and magnetic conditions.

Trade Mark—Generic Name.

The Supreme Court of Illinois held, in the case of Bolander vs. Peterson, that a generic name, or one merely descriptive of the article made or sold, or its qualities, ingredients or characteristics, and which may be employed truthfully by other makers or dealers is not entitled to protection as a trade mark, and that words designating a trade indicating that a particular class of goods is dealt in cannot be exclusively appropriated by one as a trade mark or trade name. In this case it was held that the words "Swedish snuff store," or "magazine," could not be protected.

Spectacle Lenses in Photography.

Mr. Lyonel Clark says fair results can be obtained by fixing two meniscus spectacle lenses in a tube, with their concave sides facing each other, and with a suitable diaphragm between them. His general conclusion was that they would not work well enough to cause photographic opticians to put up their shutters, but would do a certain amount of useful work, especially in the hands of those photographers who, on esthetic grounds, do not like prints sharp all over.

Early History of the Discovery and Use of Tin.

A very interesting work is that of Philip William Flower, written and published in England, and entitled "A History of the Trade in Tin; a Short Description of Tin Mining and Metallurgy; a History of the Origin and Progress of the Tin Plate Trade, and a Description of the Ancient and Modern Processes of Manufacturing Tin Plates." It is a somewhat rare work in this country, says the Boston *Herald*.

In the search for information through the archives of the world as to the origin and first employment of tin, Mr. Flower tells us that shortly after the description of the flood will be found a reference to Tubal Cain, "an instructor of every artificer in brass." The notice in Genesis thus fixes the discovery and use of tin and copper, according to the Bible, at between 4004 and 1635 years before the Christian era. And not only were the existence and use of these metals known, but the art of converting them was soon far advanced, for we find in the Book of Kings, written 1015 B. C., "King Solomon sent and fetched Hiram out of Tyre. He was a widow's son of the tribe of Naphtali, and his father was a man of Tyre, a worker in brass, and he was filled with wisdom and understanding and cunning to work all works in brass."

Any one doubting the nature of this metal can be reassured by reference to the chapter which follows, giving in detail a most elaborate schedule of the pillars, the chapiters, the baths, the lavers, the pots, the shovels, and the basins, some of cast and some of wrought bright brass, which Hiram the artificer prepared for the temple of King Solomon. Further ample evidence as to the early use of tin and brass is to be found in the Iliad of Homer, written, as it is believed, between the years 962 and 915 B. C.

We find, then, that brass—and consequently tin—existed in Tyre, the great seaport town of the Phœnicians, on the coast of Syria, about 1000 B. C. They are frequently referred to in all works relating to tin or to Cornwall. The Phœnicians were merchants, and carried on an important trade from the ports of Tyre and Sidon. These cities rivaled each other in magnitude, fame, and antiquity. The Tyrians excelled all other nations in the manufacture of a purple dye, said to have been extracted from a shellfish found on their coast. It is now well known that tin dissolved in muriatic acid produces a brilliant purple dye, and that tin dissolved in nitric acid will produce a scarlet dye. It is not unreasonable, therefore, to suppose that the use of tin in dyeing had much to do in the production of the Tyrian purple of the Phœnicians.

It is impossible to fix the date at which the export trade in tin was commenced from the British Islands, but it is certain that it existed and was controlled by the Phœnicians when Herodotus wrote his history, 450 B. C. Herodotus refers to the Cassiterides (the Scilly Islands) as the places whence they were then obtaining their supplies; but neither he nor any other historian has left us any information as to when that trade commenced. The Phœnicians called this land of tin "Baratanac," and Bochart and other historians attribute the very origin of the name of Britain to this work.

After the Phœnicians the trade in tin with the Cassiterides was taken up by the Greeks sailing out of Marseilles, the city of Massila, which was built by a colony of Greeks 600 B. C. The Phœnicians probably sailed straight across from their colony of Gades or Cadiz, and returned direct to that port with their valuable cargoes. The Greeks, however, appear to have been accustomed to coast up the English Channel, and crossing over from Kent to France, the tin was conveyed overland on horseback in thirty days to the mouth of the River Rhone.

The Romans, who had always been large purchasers of tin, were the next to follow the Phœnicians and Greeks. The following anecdote is derived from Strabo, who also tells of the conquest of Britain by Cæsar: "Formerly," he says, "the Phœnicians alone carried on this traffic (in tin) from Gades, concealing the passage from every one, and when the Romans followed a certain shipmaster, that they also might find the market, the shipmaster of jealousy purposely ran his vessel upon a shoal, leading on those who followed him into the same destructive disaster. He himself escaped by means of a fragment of the ship, and received from the state the value of the cargo he had lost. The Romans, nevertheless, by frequent efforts, discovered the passage."

As soon as the Romans made a conquest of Britain they formed in the tin province camps and roads (still visible) and left behind them vases, urns, sepulchers, and money that exhibit daily proofs of their having been a stationary people in these parts, and that Damnonium extended even to the Polerian promontory or the Land's End, limited by the western parts of Somersetshire. The Romans, as is well known, occupied Britain from B. C. 55 to A. D. 409, or 464 years, during which period the Cornish tin mines were largely worked by the ancient Britains, possibly for their own advantage, but more probably as serfs, and in A. D 409 the Romans had to give way to the Saxons.

During the Saxon dominion (from 410 to 1066) the mines were almost entirely neglected, frequent intestine commotions, and the subsequent wars with the Danes, allowing no time for such innocent and peaceful pursuits. In the year 1066 the Saxons in their turn were pushed aside by the Normans, and subsequently the tin mines in Cornwall were again vigorously developed. The Norman sovereigns derived immense revenues from the export of this metal, and, in the year 1198, when the country was almost ruined by the Crusades, Richard Cœur de Leon, then abroad, placed the management of the mines in the hands of the Archbishop of Canterbury, who, from this and other sources, was enabled to collect and remit to his employer a sum of money exceeding £1,000,000 sterling.

In the reign of King John (1199–1216) the produce was so inconsiderable that the rent of the tin farm amounted to no more than 100 marks. At this time the Jews were sole managers, if not proprietors, of the mines. The right of working the mines was then wholly possessed by the king, who, being sensible of the languishing state of the manufacture, bestowed some valuable privileges on the country by relieving it from the operation of the arbitrary forest laws, and granting a charter to the tinners.

Tin mines were known to exist in Spain, but the constant invasions of the Moors caused the mines to be abandoned or neglected.

In the year 1240 tin was discovered in the mountains of Bohemia by a Cornish tin man who had been banished from his native country, either on account of his religion or because he had committed murder. Further discoveries followed at Altenburg, in Saxony, 1458, and in Barbary, 1640.

Richard, Duke of Cornwall, brother of Henry III., 1216–1272, derived immense profits from the mines, the produce of which was subject at this period to a royalty of 40 shillings for every £1,000 in value, payable to the duke, and twice a year all the tin produced had to be brought to appointed places, where it was officially stamped and weighed.

The Jews being banished the kingdom in the eighteenth year of Edward I., 1290, the mines were again neglected till the gentlemen of Blackmoor (lords of the seven best tithings stored with tin) obtained a charter from Edward, Earl of Cornwall, with more explicit grants, privileges, etc., among them that of receiving as their own due and property the toll tin, that is 1-15th of all the tin raised. The kings and dukes of these times would appear to have treated this industry very lightly, for it is recorded that Edward I., in 1305, in the thirty-second year of his reign and the 36th of his age, mortgaged or assigned his due for one year to settle a wine bill for £750.

In 1376 the tinners were able to obtain protection by act of Parliament, but the civil wars following (viz., the Wars of the Roses) the mines were again very much neglected. When, in 1485, these wars ceased, England became more settled and tin mining became more profitable and prosperous. Prudent Queen Elizabeth (1558–1603) appears to have taken more interest in the mines than her predecessors, for she sent to Germany and brought over German miners, by whom many of the Cornish processes were very much improved.

Very little has been written, and next to nothing can be ascertained, of the progress of this trade from 1600 to 1700. In the reign of Queen Anne (1702–1714) it is recorded that the queen had in stock 5,000 tons of tin, equal to five years' consumption, demonstrating the existence of hard times for the producers, or proving that the queen was a "hard bargain" to deal with.

It was after the death of Queen Anne, but there appears to be no record of the exact date, when Eastern or foreign tin first arrived in Europe to compete with the Cornish product; but as early as 1760 small quantities of Banca tin were received in Holland. In 1787 the importation of Banca tin to Holland was so much beyond their own requirements that the Dutch shipped a quantity to England, but that same year the increase from the Cornish mines was about 500 tons. The market was, however, relieved by the East India Company taking 800 tons to China, where a market had already been opened for it. The trade with China, however, was brought to a close in 1817 by the return of Cornish tin from China to London, and the underselling of the mine product in the home market. The history of tin from that date to the present day is only a question of figures and statistics, which are beyond the scope of this article.

The discoveries of tin in Germany 500 years ago, which never became important, were practically abandoned several years since. Cornwall has safely defied all competition from Europe and the East, but the cloud which threatens her has risen in the south, in her own colonies. In the year 1872 large discoveries of surface tin ore were made in Queensland and New South Wales, and all at once a new supply appeared to find a sale in Europe.

THE GERMAN NAVY.—Eleven line-of-battle ships, with an aggregate displacement of 70,000 tons, are now being built for the German government, viz., three at Bremen, two at Gaarden, near Kiel, one at Wilhelmshafen, three at Dantzic, two at Bredow, near Stettin.

How to Preserve Health.

One of the best ways to keep in good health, says the *Monthly Bulletin*, is not to think or worry too much about it. If you feel strong and well, don't imagine that some insidious disease may be secretly attacking your constitution. Many people are like the inexperienced traveler, who anxiously inquired about the symptoms of seasickness, and how he should know when he had it. One generally knows when he is sick, and frequently many supposably alarming symptoms prove, upon investigation, to be either perfectly natural occurrences or of very slight importance.

Eat and drink what you desire, as long as it agrees with you. Your stomach knows pretty well what it can digest. Plain, simple food is desirable, as a general thing, but the luxuries of the table, in moderation, will do no harm.

Alcoholic beverages are not fit for habitual use. They are true medicines, and should only be used like any other medicines—under the advice of a physician. As a regular beverage they can do no good, but will almost certainly do harm.

Take all the sleep you can get, but remember that the necessary amount varies greatly for different persons. Some must sleep at least nine hours, while others thrive under six. Only don't rob yourself of what you really need. The "midnight oil" is a terribly expensive illuminant to burn either for purposes of labor or study.

Always treat a common cold with great respect. Ninety-nine times out of a hundred it will get well any way, but the hundredth cold, if neglected, may lead to bronchitis, pneumonia, or consumption. It is best to take no such chances.

If you are sick enough to need any medicine at all, beyond the simple remedies familiar to all, you are sick enough to need the attendance of a physician.

By all means take as much exercise as you can, and be in the open air as much as possible. Outdoor life is the natural condition of mankind, and the more one can have of it, the better. The practice must not be carried to extremes, however. There are many days when one is much better off in a warm, comfortable, well-ventilated house than trying to take outdoor exercise in a midwinter storm, or under a July sun, and no one ever strengthened his constitution by sleeping with his bed-room window open with the outside temperature at zero, or allowing the snow to drift in upon his pillow.

Fresh air, sunlight, good and sufficient food, pure water, outdoor exercise, temperance in all things, and a cheerful disposition, are the chief remedies in nature's dispensatory, and are worth more than all the drugs and medicines of the shops. Dr. Holmes has truly said that if nine-tenths of all the medicines, patent, proprietary and otherwise, in the world were poured into the ocean, it would be all the better for mankind and all the worse for the fishes; and the best physician can do little without good nursing, and thus aid nature in throwing off disease.

A Remarkable Run of Iron.

The Mancelona (Mich.) *Herald* says: Stack No. 2, blast No. 1, of the Antrim Iron Furnace, completed the third year of its present blast April 15. Number of days in blast, 1,050, and the total product during that time amounted to 66,347 tons of pig iron—a daily average of 63⅛ tons. A trifle over a year and a half of this run, or, to be exact, 582 days of it, the stack was blown with a small Weimer engine, with a product of 32,326 tons—a daily average of 55⅝ tons. The balance of the run (468 days) was made with a large engine of the same make, during which time the product amounted to 34,021 tons—a daily average of 72⅝ tons.

To make this amount of iron, 115,410 tons of ore was used and 146,000 cords of wood consumed. Had the stack been blown during the entire period with the large engine, the total product would, of course, have been much greater, but the record is a remarkable one, nevertheless, and it is believed that no charcoal stack in the United States has ever made so long a run or so large an amount of iron with a single lining.

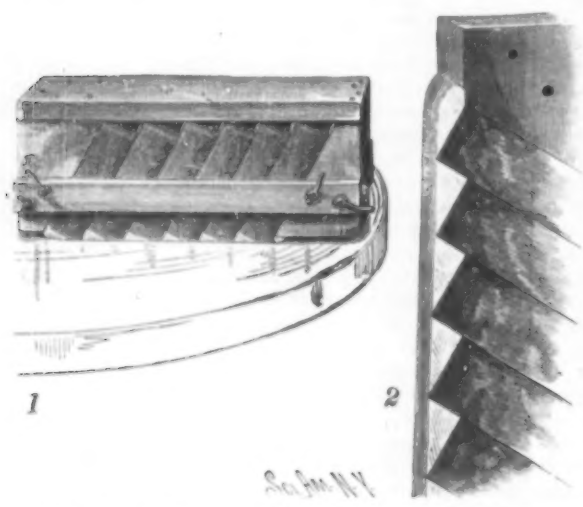
Cutting Glass Tubes, Bottles, etc.

Another method, by Prof. Wm. Thomson, consists in having some strips of thick blotting paper at hand from a quarter to half an inch in width, and of different lengths. Two pieces of such paper are wetted and wrapped round the bottle, tube, or other vessel to be cut, once or oftener (once is sufficient). These pieces of paper, cut true, are wrapped round the vessel like two bands. They must not be placed too closely together—say from a quarter to three-eighths of an inch apart for large vessels, and rather less than a quarter of an inch apart for tubes of an inch or so in diameter. When this is arranged a fine flame about two or three inches long is allowed to play on the glass between the two pieces of wet paper, the vessel being slowly revolved and the point of the flame kept between the two papers. Within a minute usually the vessel separates with a clean cut along the line against which the flame played.

NEW METHOD OF CHAMFERING STONE.

The usual method of chamfering stone is to chip off the corners by means of a mallet and chisel, and afterward to grind and polish the surfaces separately, thus involving a great amount of labor and much expense.

Mr. John L. Dalot, of Addison, Me., has recently patented a novel method for producing chamfers upon the edges of stone blocks and slabs without liability of chipping the corners. According to this method, the slabs are mounted in a frame which holds them at the required angle, and the edges of the blocks or slabs to be chamfered are covered with a suitable cement, which fills in the angles between the blocks, and sustains the surface of the stone so that it does not chip in the process of grinding. Any suitable cement is used for this purpose; plaster of Paris has been found effectual and convenient. The arrangement of the slabs in the frame is shown in Fig. 1, and in Fig. 2 the slabs thus prepared are shown in position on the lap which carries the abrasive and polishing material.



DALOT'S APPARATUS FOR PRODUCING CHAMFERS.

It is obvious that this improvement is equally applicable in hand polishing, where an ordinary hand rubber is used. The chamfers produced according to this method are uniform, the angles are sharp, and the surfaces plane.

IMPROVEMENT IN JACK-SCREWS.

We give an engraving of a jack-screw which is designed to operate in much the same manner as the well known hydraulic jack. The screw turns in a nut in the standard, and carries at its upper end a flange and ratchet wheel. The screw-operating lever is pivoted to a movable ring inclosing the flange, and the movable ring carries a pawl for engaging the ratchet. The upper end of the screw is prolonged, and furnished with a shoe for receiving the load when it is desired to apply pressure from the upper end of the screw. Upon the lower end of the screw is swiveled an arm which extends through a slot in the standard, for engagement with objects to be lifted from the ground. By oscillating the lever, the ratchet is engaged by the pawl and carried around, thus turning the screw and raising or lowering the object supported by it. The pawl may be reversed so as to turn the screw in either direction.

KALBACH'S JACK-SCREW.

This invention has been patented by Mr. M. D. Kalbach, of Harrisburg, Pa.

IN relation to his scheme for a tubular railway across the Straits of Dover, Sir E. J. Reed points out that, unlike the tunnel, the tube can be destroyed if required by torpedoes or mines by the fleet, and hence could never be used by an enemy to maintain the communications of an army of invasion.

Artesian Wells.

Whether water can be obtained by artesian borings in any district, or not, depends upon the geological structure. All rocks contain more or less water. Sandy formations absorb water mechanically, and fine sand can take in about one-third of its bulk of water, and if a well be sunk into it, and regularly pumped from, nearly all of this moisture can be drawn out. Chalk, and similar rocks, which are made up of very fine particles, closely compacted together, contain a very large proportion of water, but from the capillary attraction of this rock, very little of this water will drain into a well sunk into it. But as there are often wide crevices in chalk rocks, through which water flows in much greater quantity than the rock can retain in its pores, wells sunk into chalk formations often secure water. There is another formation, that of the clays, through which water does not percolate, and a well sunk in this rock cannot secure water. In the geological strata of the earth, the veins which are impervious to water and those through which the water readily penetrates may occur in alternating layers, and when in this manner a pervious bed of earth lies between two impervious ones, it is plain that we have a formation altogether favorable to the objects of the artesian well. For, if a perforation be made through the retentive rock, into the water-logged strata below, the moisture there contained will rise through the bore to a height depending upon the pressure of water which has accumulated in the confined space between the two impervious veins. When, as so often happens, especially when the surface of the country is uneven, the vein of water-yielding sand may run beneath the surface of the earth, to a level far above the point where the boring has been made, the water will rise rapidly in the well, to the surface of the earth, and often higher, and will then flow continuously by hydrostatic pressure. As veins of sand or pervious rock run through the earth everywhere, there seem to be few places where the process of boring cannot secure water at less or greater depth. Many artesian wells have been made in the deserts; in the Sahara a number of wells made in this way are transforming a perfectly arid land into a fertile, beautiful country. And as surface waters are continually percolating into the strata from which the artesian well draws, such wells seldom fail, even after many years of usage. There are such wells in the Old World that have been in use for centuries.—*Chicago Inter-Ocean.*

OPEN COLUMN MANOMETER ON THE EIFFEL TOWER.

M. L. Cailletet, the eminent French physicist who has become famous for his researches on the liquefaction of gases, has put the Eiffel tower to a new use. As a verifier of high pressure instruments the open column mercury manometer has been found unsurpassed. Already M. Cailletet has used one over three hundred feet high. In the Eiffel tower he has recently established one three hundred meters in height, giving unrivaled opportunities for standardizing high limit pressure gauges.

As a glass tube could not be constructed that would be practical under so great a pressure, a soft steel tube was adopted. This was carried up the tower and secured thereto as shown. It is about 4 millimeters (0·16 inch) in internal diameter. It is attached to one of the rails of the inclined elevator until the lower platform is reached. A stairway was constructed along the line it follows. A portion of this section is shown in the cut. Then, by a series of vertical and almost horizontal elements, the tube makes its way to the second platform, whence its rises vertically, except for one break, to the top of the tower.

The lower end of the tube enters a vessel of mercury and is immersed in the same. By pumping water into this vessel, the mercury is forced up into the tube.

As it would be manifestly impossible to read the level of the mercury in the opaque tube, a series of auxiliary open glass reading tubes is connected to it at intervals. These communicate through a lateral connection with a stop cock with the main tube. If the cock of one of the connections is open as the mercury reaches the level of the auxiliary tube, it rises in it to the same level.

Telephonic communication is maintained between the observer at the tube and the manometric station, by which the movements of the pump and escape valve are directed. If too much water is pumped in, a little is allowed to escape. As the point is nearly reached, the pump is worked very slowly, so that, by practice, the exact point can be reached nearly every time. An overflow tube is provided in case any of the mercury escapes. After a reading the cock is closed if higher pressure readings are to be taken, and the mercury is pumped up to the next desired auxiliary reading tube.

The manometric station, whose interior in shown in our illustration, is situated at the base of the western pillar of the tower. The observation or auxiliary tubes are known by number, and besides carry each an independent graduation. In practice the pump is caused to force the column up to a tube of a certain number and to a definite graduation on the scale of the same tube.

In this way high pressure gauges can be graduated up to 400 atmospheres. Of course the reliability of the method depends on the accuracy of the levels of the reading tubes. Special care has been taken to determine these levels.—*Illustration.*

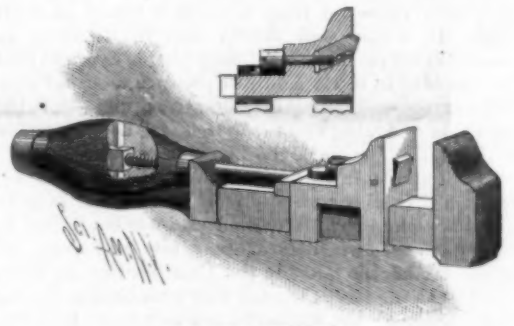
Healthy and Vigorous at 104.

Mrs. Mehitable Dayton, the oldest person in Connecticut, celebrated her 104th birthday on May 1. Mrs. Dayton received her guests sitting in a chair which is 150 years old. She is a remarkably well preserved woman, and does not look over 70 years. She is perfectly healthy and vigorous. Mrs. Dayton was born May 1, 1787, the eldest of nine daughters of Samuel and Mary Stratton, who lived but a few rods north of the house in which she now resides. Each of her sisters married, and each lived in a different State. There are two other sisters now living—Mrs. Dolly Morgan, of Holly, N. J., aged 91, and Mrs. Electa Haskell, of Otis, Mass., aged 89. On December 14, 1806, she married Ezra Dayton, of Marlboro, who was also one of ten children. They had ten children, two of whom are now living.

AN IMPROVED WRENCH.

We give an engraving of a new wrench recently patented by Mr. Frank S. Chaney, of Honolulu, Hawaiian Islands. This wrench is designed for applying and removing nuts of various kinds, and to holding and turning round objects such as rods and pipe. The construction of the wrench, as will be seen by reference to the engraving, is simple and comparatively inexpensive. The shank and thread are formed integrally of a single piece of steel, and a sliding jaw, which is fitted to the shank, is made of steel by the usual method of drop-forging.

In the face of the jaw is an oblique mortise in which is placed a pawl of hardened steel, which is adjusted in the mortise by a screw, as shown. When the wrench is to be used upon nuts or square objects, the pawl is withdrawn into the mortise, but when it is to be used upon round objects, the pawl is projected beyond the face of the movable jaw. The lower end of the shank is curved and bent at a right angle to receive the pivotal screw of the handle. The handle contains a nut which receives a rod connected with the movable jaw, and the rod is guided by a clip attached to the straight portion of the shank. By turning the handle in one direction or the other the required adjustment of the movable jaw is secured.



CHANEY'S WRENCH.

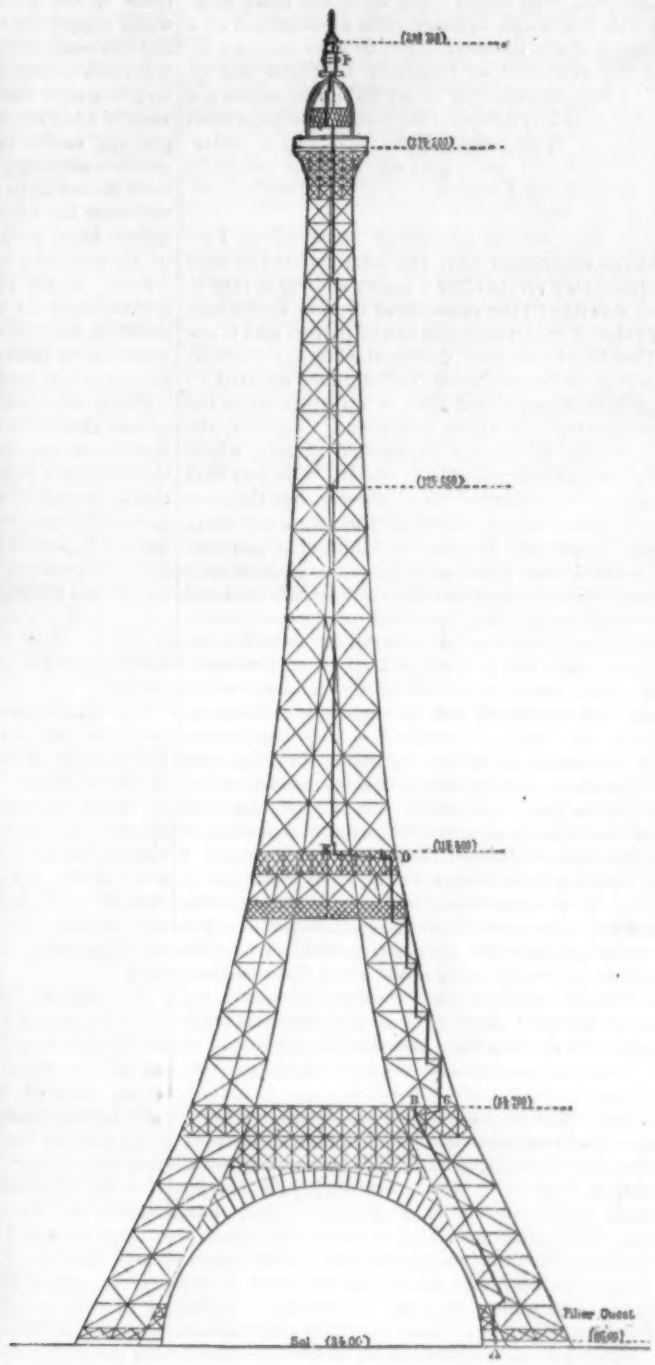
The Breathing of a Locomotive.

The "breathing" of a locomotive—that is to say, the number of puffs given by a railway engine during its journey—depends upon the circumference of its driving wheels and their speed. No matter what the rate of speed may be, for every one round of the driving wheels a locomotive will give four puffs—two out of each cylinder, the cylinders being double. The sizes of driving wheels vary, some being 18, 19, 20, and even 22 feet in circumference, although they are generally made of about 20 feet. The express speed varies from 54 to 58 miles an hour. Taking the average circumference of the driving wheel to be 20 feet, and the speed per hour 50 miles, a locomotive will give, going at express speed, 880 puffs per minute, or 52,800 puffs per hour, the wheel revolving 13,200 times in 60 minutes, giving 1,056 puffs per mile.

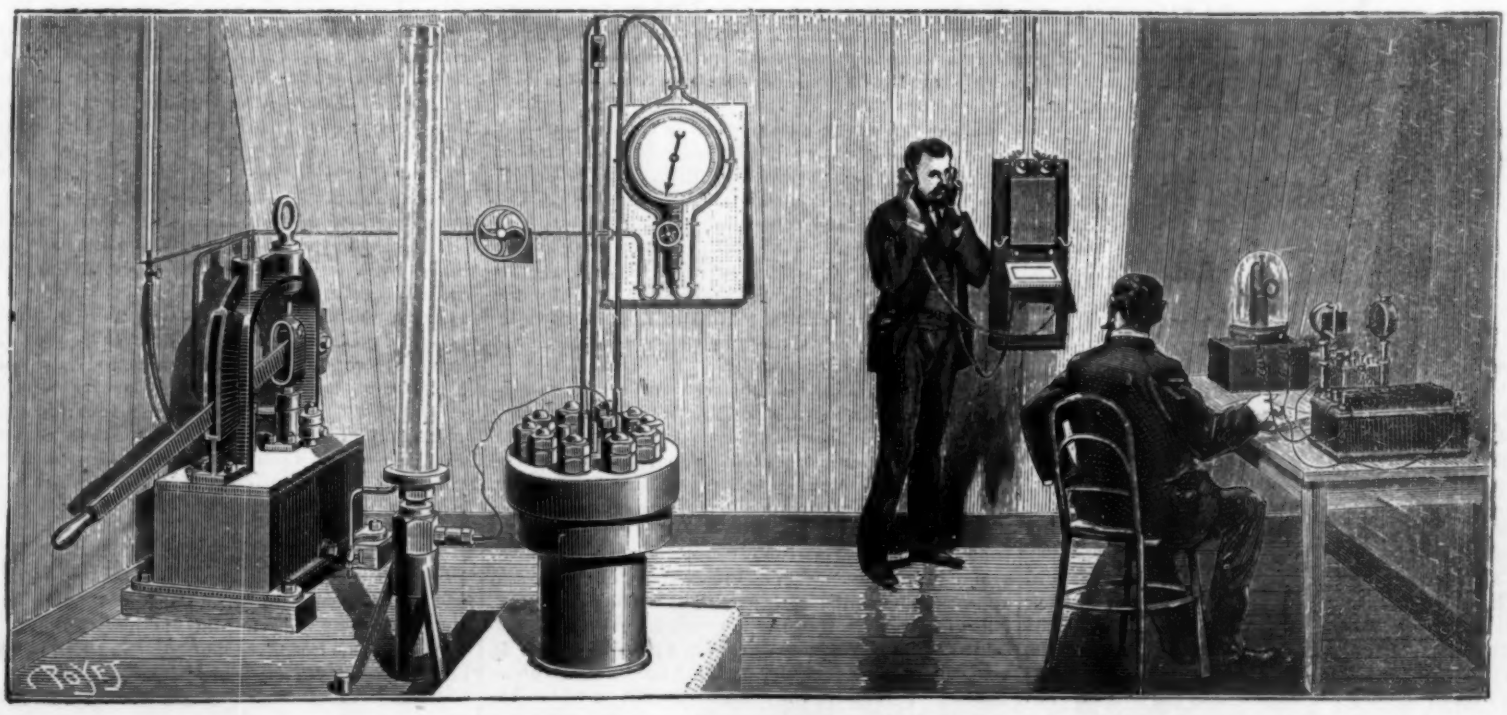
The Electric Omnibus.

A curious incident was lately witnessed in Palace Yard, Westminster, London. About four o'clock an electric omnibus started from the St. Stephen's Club, and carried some dozen members of Parliament round to the members' entrance in Palace Yard. Admiral Mayne was in charge of the omnibus, and among the passengers were Sir William Marriott, Sir Walter Foster, Major Waring, Mr. Majoribanks, and Sir William Walrond. The arrival of the car attracted a large crowd of members, and subsequently a series of trips was made round the neighboring streets, some hundred members in all availing themselves of the opportunity of testing the practical utility of the omnibus.

READING THE DEGREES OF PRESSURE.



SITUATION OF THE MANOMETRIC TUBE ON THE EIFFEL TOWER.



AIR PUMP FOR FORCING THE MERCURY INTO THE TUBE.

OPEN COLUMN MANOMETER FOR EXPERIMENTS ON COMPRESSION OF GASES.

The Odor of the Soil after a Shower.

BY DR. T. L. PHIPSON, F.C.S.

This subject, with which I was occupied more than twenty-five years ago, appears from a paragraph in a late number of the *Chemical News* to have recently attracted the attention of Professor Berthelot and M. Andre. I find, on referring to my old notes, which are dated 1865, that it is doubtful whether I ever published the results of these observations; and as the distinguished chemists I have just named have not quite solved the problem, I hasten to give the results I obtained so long ago.

After a considerable number of observations, I arrived at the conclusion that the odor emitted by soils and sedimentary strata after a heavy shower of rain in summer was due to the presence of organic substances closely related to the essential oils of plants, and it appeared evident to me that, during the hot dry weather, these porous surfaces absorb the fragrance emitted by thousands of flowers, and give it up again when the rain penetrates into these pores and displaces the various volatile substances imprisoned therein, which are only very slightly soluble in water. I believe that many kinds of soil possess this property, but those on which my observations were first made were the chalk soils of Picardy, in France. I found that not only chalk, but also marls, compact limestones, phosphatic rocks, and some kinds of schists and amphibolites are porous enough to possess it to such a degree as to emit a decided odor when they are strongly breathed upon.

Finding the property of which I speak very remarkable in certain chalk rocks of Picardy, I endeavored to ascertain the nature of the substance, or substances, to which it was owed. I dissolved a very large quantity of the chalk in dilute hydrochloric acid, and passed the carbonic acid through various media, water, alcohol, weak potash solution, and dilute acid; but none of these liquids appeared to arrest the passage of the odoriferous substance. The only liquid which I found would retain it was an aqueous solution of bromine. This arrested it, and when the bromine solution was afterward carefully evaporated at a low temperature, a yellowish product, soluble in alcohol, and having a strong odor of cedar wood, was obtained, which, from its chemical and physical properties, appeared to be very similar to, if not identical with, bromo-cedren, derived from essence of cedar.

Magnetic Rocks.

In a letter to *Nature* the following instance of extraordinary local magnetic disturbance, due to the presence of magnetic rocks, is cited by Commander Creak:

In September, 1885, when her Majesty's surveying vessel Meda was passing Bezout Island, near Cossack, Northwest Australia, a steady deflection of her compass of 30 degrees was observed. This remarkable result has, however, since been exceeded by observations made in the Penguin on November 6, 1890. The Penguin being two miles north, 79 degrees east, from Bezout Island, a deflection of 22 degrees was observed. The ship was immediately anchored, and some hours of the next day were spent investigating the matter. On Bezout Island itself the absolute values of the variation and dip were normal, the dip being 50 degrees 1'·7 south. But at a position north 79½ degrees east, distant 3·14 miles from that on Bezout Island, the observed dip on board was 83 degrees south, with a very small deflection of the compass. At 900 feet to the westward of this the dip was normal, and it decreased rapidly as the center was quitted in any direction. At about 100 feet south of the center of disturbance, the compass was deflected 55 degrees. This was the largest deflection observed, but the compass was disturbed over an area of about a square mile. The general depth of water in this area was nine fathoms, and the quality of the bottom quartz sand. The observations of the magnetic elements at Cossack and the neighborhood showed little or no disturbance from local magnetic effects. It is therefore evident that the disturbances were due to magnetic minerals at the bottom of the sea.

An Ancient Lock.

The *European Trade Mail* says that "an Egyptian lock has been found which was in use more than 4,000 years ago. The old Egyptian lock was not made of metal, like those we use nowadays, but of wood, and the key that opened it was wooden, too. On one side of the door to which it was fastened there was a staple, and into this staple fitted a wooden bolt that was fixed to the door itself. When this bolt was pushed into the staple as far as it would go, three pins in the upper part of the staple dropped into holes in the bolt and held it in its place, so that it could not be moved back again until the pins were lifted. The key was a straight piece of wood, at the end of which were three pegs the same distance apart as the pins which held the bolt firm. When the key was pushed into the bolt through a hole made to receive it, the pegs came into such a position that they were able to lift the pins that fixed the bolt, and when these were lifted, the bolt could be lifted out of the staple." The most modern locks work on a similar principle.

Hydraulic Monitors.

One of the most noteworthy features in many portions of the gold region is the elaborate system of water supply for the use of the hydraulic mines and the tremendous changes which were the result of the few years during which hydraulicking was at its height. So great have been these changes—hills washed away, valleys filled up, others created—that in many localities the entire landscape has been altered. The old proverb ascribing the power to remove mountains to such as had faith only to the amount of a grain of mustard seed has never been exemplified, but the hydraulic miners have afforded the most ample demonstration of their ability to move mountains in the search of wealth. Lofty mountains have in fact been brought low through no other agency than the pipe line, the monitor, and the sluice, and the tremendous power of water never received such an exemplification as in the history of the hydraulic mines of California.

There are, indeed, so many remarkable facts connected therewith that, were they not abundantly substantiated, one might well be pardoned for receiving their relation with incredulity. One might not believe that a stream of water issuing from a nozzle or pipe six inches in diameter, and with no other force but gravity behind it, would have much effect at any considerable distance from the aperture, yet such an apparently insignificant stream, with a fall behind it of 375 feet, will carry away a solid bowlder weighing a ton or more at a distance of 50 to 100 feet, while at a less distance it will toss such a bowlder about as a boy would throw a pebble.

The velocity and force of such a stream as it issues from the nozzle of the monitor is something terrific. The column of water is solid—so solid that if one were to undertake to thrust any object into it, it would make no more impression than if it were iron instead of liquid. If a crowbar or other heavy object be thrust against the stream, it would be snatched from the hand and thrown to a great distance as if it were a featherweight, while the man who should firmly grasp an ax and attempt to cut through the stream would undergo an experience that he would remember for many a day.

If a man were to receive the full force of such a stream at a distance of a couple of hundred feet, even though the impact be momentary, he would be killed as quickly as though struck by a cannon ball. He might escape being mangled, but the breath would be most effectually and suddenly expelled from his body.

At 400 feet from the nozzle, a six inch stream with 375 feet fall, swung momentarily against the trunk of a tree, will denude it in a second of the heaviest bark as cleanly as if an ax had been used. Whenever such a stream is turned against a gravel bank it cuts and burrows into it in every direction, gouging out great caves, causing thousands of tons of earth to fall, which is in turn quickly disintegrated and washed into the sluices. Bowlders so heavy that a man can scarcely lift them are tossed about like chaff, stumps and trunks of trees are thrown to one side like straws, and the work of destruction goes on at a pace that is appalling. If one who has never seen a monitor in operation under full head could imagine the ordinary stream from a fire hose magnified about a thousand times, he would be able to form some conception of its power.

The water is brought in open ditches or flumes, sometimes from a great distance, around mountain sides, and across valleys and ravines. When the vicinity of the mine is reached a box is put in, from which a pipe conducts the water to the point where it is to be used. It is the distance between this box and the level of the monitor that gives the pressure. With from 300 to 450 feet fall the execution done is tremendous. At the monitor the water is conducted into a still smaller pipe with nozzle about one-third the size of the supply pipe, the compression giving it still greater force. The monitor is constructed something like the ordinary hose nozzle, but has a ball joint that permits it to be swung in any direction. It is balanced with weights, and by means of an ingenious device known as a deflector the tremendous stream can be turned in any direction by the slightest force. Almost the weight of a finger will suffice to direct the movement.

Easily as it is managed, however, the monitor sometimes becomes uncontrollable, and when this happens a scene of destruction and even death ensues. The pipe sways to and fro at its own volition, and the stream flies first in one direction and then in another. If the miners are not warned in time to get out of range, they may be mowed down as if by the discharge of a volley of grape. Sometimes the runaway monitor seems as if manipulated by some bloodthirsty monster, and appears to be deliberately turned upon the fleeing men, following them as they flee in every direction and overtaking them before they can reach a place of safety. In one case a sluice tender, hearing an unusual noise, raised himself above the edge of the cut in which the sluices ran just in time to receive the full stream square in his face and chest. He was knocked down, thrown into the sluice, and washed away. When found his body had not a stitch of clothes upon it, and apparently every bone in it was broken.

When a monitor gets away from control in this manner, there are two things that can be done. The water may be shut off at the head gate, a process involving much delay and perhaps loss, or some brave man may rush in and get to the monitor without being struck by the stream. To do this requires agility and pluck. The stream is liable to box the compass inside of a minute, and its course must be watched and the probable direction noted. Then over the rough surface the man must hasten, careful not to make a misstep, and at the same time ready to flee should the erratic stream betray a tendency to change its course so as to endanger life. There have been many hairbreadth escapes and some thrilling exhibitions of bravery under such circumstances as these, and it has been only by the exercise of the greatest coolness and bravery that great loss of property and life has been prevented.

A. J. Bowie, of this city, in his work on hydraulic mining, states that the stream from a six inch nozzle, with a 450 feet vertical pressure, delivers a blow equal to 588,735 foot pounds per second, equivalent to 1,070 horse power. When one comprehends this fact, he will be abundantly prepared to believe almost anything that could be said about the power exerted by such a stream.

With a force such as that exerted by the stream from a monitor, it is apparent that a tremendous amount of material can be washed away in a very short time. The quantity removed depends, of course, upon its nature, whether loose soil, ordinary gravel, or cement gravel. In some places, under favorable circumstances, as high as thirty-six cubic yards to each inch of water have been removed in twenty-four hours. With a flow of 500 inches the bulk removed each day is thus seen to be enormous. In cement gravel the amount handled daily is as little as three cubic yards per inch. The quantity handled daily is, however, almost entirely dependent upon the grade of the sluices. In the case of the highest amount just mentioned the stream had a fall or head of 350 feet, the banks were 100 feet high, and the sluices had a grade of one inch to the foot, while 1,000 inches of water were used. Under such conditions and with such results it must be apparent that the removal of mountains is only a question of time—and not a very long time, either.

Some idea of the immense amount of earth and gravel moved by the hydraulic mines of this State can be gathered from some recently published statistics upon this point. During the height of the hydraulic industry there were in use from the Feather, Yuba, Bear, and American Rivers, Butte Creek, and the two Dry Creeks, a total of 10,650,505 miner's inches of water each twenty-four hours. At an average of 3⅛ cubic yards of gravel to the inch there was thus washed away daily 38,000,000 yards of material. This is a low estimate. As an actual fact much more was carried away. But the amount stated represents a mass of earth 500 yards long, 386 yards wide, and 200 yards high. With such a tremendous quantity washed away every twenty-four hours, it can readily be understood that no great length of time need elapse literally to remove mountains and cast them into the sea.—*San Francisco Chronicle.*

The Advance in Paper Making.

In an interview with Col. A. G. Payne, of the New York and Pennsylvania Company, by a representative of the *Paper Trade News* relative to the prices for soda fiber, Mr. Payne, who was a pioneer in the business, said: "I remember when soda fiber brought thirteen cents; that was about eighteen years ago, when it was first used for paper. It is now quoted at three and three-fourths cents. The Yaryan system revolutionized the cost of recovering soda ash by cheap evaporation. Until recently this system was used by Americans only, but now they have adopted it abroad, and are using it at Glasgow. Everything is cheaper to-day in the manufacture of soda fiber than it was in the old times, except wood and labor, and it was natural for the decrease in the cost of the production to be accompanied by a falling off in the price of the product. The manufacture of chemical fiber has become a great industry, and the fiber itself is used more in the manufacture of good book paper than ever before. There were only two mills which manufactured chemical fiber at the start, and they produced twelve tons daily, whereas now the total monthly product foots up to fifteen million pounds. This increase does not seem so great, however, when we consider that a five ton paper mill in the early days was a big thing, whereas to-day mills with an output of thirty or forty tons are common."

THE telephone line between London and Paris went into regular operation on April 2 with much success. The charge is $2 for a talk of three minutes. The opening of this line is considered a big thing in Europe. The distance is 297 miles, of which 23 miles are by cable laid under the British Channel. Long distance telephoning has been in vogue in this country for many years. In the SCIENTIFIC AMERICAN of March 24, 1883, we recorded a conversation we had by telephone between New York and Cleveland, O., a distance of 650 miles.

Correspondence.

Chinese Taxes on Ginseng.

To the Editor of the Scientific American:

For the information of your readers I wish to correct an error in Consul Nicolas Pike's reply to L. C. Shussar *re* ginseng. American ginseng, clarified, pays an import duty of Hai Kwan taels 8 per picul (133⅓ lb.) Crude ginseng pays a duty of taels 6 per picul. The Hai Kwan tael is equal to $1.53 (Mexican).

J. W. BURKE.

Newchwang, N. China, March 19, 1891.

Facts about the Fertilization of our Fruits.

To the Editor of the Scientific American:

The devices whereby nature would insure the fertilization of our fruits are manifold. The winds are made her "common carriers." Every passing breeze is called into requisition. A banquet is spread for the insect world. There is gorgeous coloring to catch the eye, the sweetest perfumes to lure the smell, and cups brimming with nectar to gratify and intoxicate the taste. But each parting guest on leaving the banquet hall becomes a postal messenger, bearing the loves of the flowers. To the wide circle of relationship of the insect world, of fly and bee and bug and butterfly, there must also be added at least one from the family of birds—the humming bird; the extraordinary fertility of the flora of the isle of Juan Fernandez being credited by the distinguished botanist attached to "her Majesty's fleet of exploration" to the humming birds, who "throng the flowering plants and trees of the island," some varieties of these birds being indigenous.

But with all the precautions which Nature has taken and facilities provided of air, insect, and bird, it remains that some varieties of fruit are defective in their methods and means of fertilization. All of our strawberry growers are made familiar with this fact, as connected with the natural sexual division of staminate and pistillate varieties. The term bi-sexual is applied to the former, though, as is implied, the bi-sexual being self-fertilizing. Yet even here there is a distinction and a difference. Some of the so-called self-fertilizing varieties have their productiveness materially enhanced by the presence of another variety more potent than themselves. The fertility of the Sharpless (a bi-sexual variety) is improved by the proximity of the Jessie or Wilson. It is a familiar fact than many of the bi-sexual varieties are not only *self*-fertilizing, but are of such superior potency, having, as the fruit growers would say, so much pollen as to be available, and as such largely useful in fertilizing the pistillate varieties, which, in turn, properly fertilized, become the most productive. The law of affinities obtains in the vegetable as in the animal kingdom. In the selection of varieties, to obtain the best results this matter of affinity should be considered, plants, like animals, often possessing a stronger affinity for a different strain of blood, as, for instance, with us the Jessie proves the best fertilizer for the Bubach No. 5. Both being large berries and of moderate firmness, for effectiveness every third row set with Jessie being sufficient; and here, to add to the firmness and duration of bearing, Gandy's Prize, a late, firm, potent variety, may be made to alternate with Jessie to advantage; the order then being one row of the Gandy, two rows of the Bubach, and the fourth of Jessie. The principle involved being simply this: that where any variety is wanting in any point, as of productiveness of plant or fruit, of *firmness* of *texture* or *quality* of fruit, we choose for its fertilizer a variety excelling in the point lacking. This matter of family affinities we claim to be a fact of horticulture, and the success of the fruit grower depends largely upon his recognition of this fact. The Warfield No. 2 should be crossed with Burt's Seedling, or what may (of the new varieties) prove still better, the Governor Hoard. For earliness, firmness, and potency as a fertilizer, we would recommend the Michal's Early.

What may be said of the strawberry applies to our native plum—*Prunus americana*—now much improved by culture and careful selection from new seedlings. We find here in some instances the need of a fertilizer, and again the superior potency of certain varieties to be a marked characteristic. Many varieties, like the Winnebago and the Miner singly, are almost worthless; but if set in close proximity with a strongly potent variety, as the De Soto, their productiveness will be assured. In the case (with the plum) of large, vigorous trees, making abundance of wood, but shy bearers, we would recommend grafting in the uppermost branches and extremities of limbs, by either cleft or whip grafting as occasion may require, scions of some potent variety. This, to succeed, should be done as early as possible in the season. The condition of bark and bud of tree and scion should be the same. The plum starts early in the season, and is impatient of delay in the scion.

Many of our grapes are deficient in their productive powers, the flowers not being sufficiently self-fertilizing. Instances are not wanting of this among our native varieties and among our wild grapes; but it occurs more frequently with the hybrids, where some foreign variety (*Vitis vinifera*) has been crossed on some native (*Vitis labrusca*). While soil, situation, pruning, manuring, in brief, thorough intelligent culture, are important factors, we would suggest the use of some potent variety. We instance three varieties, one each of the black, red, and white grapes, whose quality is such as to render them worthy of a place in any amateur collection, yet each shy bearers. For the Moore's Early (black) we would suggest as a fertilizer the Telegraph, also an early black grape and an immense bearer. That noble table grape, the Brighton, a shy bearer, its blossoms apparently imperfect, we believe to be benefited by the near planting and training together on trellis of the Vergennes—a variety possessing vigor of vine with great productiveness. That lovely white grape, the Eldorado, to insure fertility should have for a near neighbor the Niagara or Pocklington.

As to the apple, in the course of our experimenting with seedlings, we have had a curious illustration of this matter of fertilization.

We had drilled in together a quantity of the seeds of the Duchess of Oldenburg and of the Talman Sweet. Of the seedlings, two of each variety were allowed to remain, and they grew up to bearing age side by side. The first to fruit was the seedling of the Duchess, bearing the fifth year from the seed, followed the next year by the Talman seedling. And now for the apparent results of *fertilization*. The Duchess (as is well known), a summer apple, coarse-grained, tart, mainly desirable for cooking; the Talman Sweet, as its name suggests, a sweet winter apple, of finer grain and an excellent baker. The seedling Duchess proved in the main true to the Duchess type as in size and color, shape more conical, less tart, an early fall rather than summer apple, and (unlike the Duchess) a fairly good keeper. These the individual traits of the seedling.

The Talman—in size, shape, color—*perfectly true* to original, even to the freckles on its skin and the raised hemispherical line (the Talman Sweet trade mark). Nothing of resemblance being lacking in externals, even to the minutest particular. But instead of being a winter apple—a late keeper—the seedling has developed a *summer* apple, its grain becoming coarser, and from a standard sweet it has become a sub-acid. Though somewhat inclined to "water core," yet an excellent dessert fruit, an apple "to eat (as the phrase is) out of hand." Its vicinity, when ripe, the most "popular summer resort" on our premises. Here the Talman has evidently been fertilized by the Duchess, either, as we suspect, at a period prior to production of the seed sown or the result of a later cross of these two seedlings at period of blossoming.

J. P. ROE.

Lake Rest Farm, Oshkosh, Wis.

Phosphatic Chalk in England.

The discovery of a deposit of phosphatic chalk in a pit near Taplow has been announced. At the request of the Director-General of the Geological Survey, Mr. Strahan undertook the investigation of the deposit, and laid the results before the Geological Society of London on the 25th of March. The pit from which the original specimen had been collected is old and disused, but has in former years yielded a large quantity of chalk for agricultural purposes. In the lower part it exposes flint-bearing chalk of the usual character, and in the upper part two bands of the brown phosphatic chalk, 8 feet and 4 feet thick respectively, which are separated by 12 feet or 14 feet of nearly white, flintless chalk.

Under the microscope the brown chalk proves to be a purely organic deposit. The fine white mud removed by washing in water consists of some extremely minute bodies common in the chalk, known as rhabdoliths, coccoliths, and discoliths, which, though of doubtful history, are believed to be of organic origin. The brown sand is made up of the following organisms, taken in order of their abundance. First, the shells of foraminifera; secondly, small, crystal-like prisms broken from the shells of the *Inoceramus*, a common chalk mollusk; thirdly, comminuted bones, teeth, and scales of small fish; and, lastly, small oval pellets, the exuviæ of fish, which were probably about the size of sprats. The foraminifera include numbers of genera common in the chalk, such as *Globigerina*, *Textularia*, *Cristellaria*, and *Planorbulina*. They are, generally speaking, filled with an opaque mass of phosphate of lime, the shell itself being sometimes carbonate of lime and sometimes phosphate in a translucent form. The small prisms from the *Inoceramus* shells are also partly converted into phosphate of lime, while the fish remains and the pellets consist, as usual, principally of this substance.

By treatment with acetic acid a portion of the carbonate of lime which cannot be removed by washing can be dissolved out, the phosphate of lime being unaffected by the process. These phosphatized portions of the organisms can thus be separated out from those which have remained in their original mineral condition. In some cases the phosphate has so completely filled the foraminifera that it has penetrated the innumerable little pores, or *foramina*, in the shell, from which these organisms receive their name. In such the removal of the shells by acetic acid leaves an internal cast in phosphate, covered with a short crop of little hair-like processes, each of which is the cast of a foramen.

A comparison of the French phosphatic chalk with that from Taplow establishes their identity beyond doubt. In general appearance they are indistinguishable, while the same organisms, in a similar condition of phosphatization, occur in both. They occupy, however, about the same position in the chalk system. The Belgian deposit is somewhat newer—later, in fact, than any chalk existing in England; but in appearance and composition it closely resembles the English phosphatic chalk. The microscope, however, discloses the difference that in the Belgian rock foraminifera are comparatively scarce, and are not phosphatized. The fish remains are similar in all these chalks; but from the Belgian chalk the remains of a saurian upward of fifty feet in length have been unearthed. This phosphatized chalk is at present known in one pit only in England, and, though search is being made along the outcrop of the same beds, it has not at present met with success.

Saw for Steel.

General Manager Potter, of the Homestead mills, of Carnegie Brothers & Co., has invented a cold saw for the purpose of sawing iron and steel, which has proved a great success, and is creating considerable interest. For some years an instrument has been in use, known as the hot saw, that is, it could only cut metal that had been heated to redness, but it is not equal to the new saw brought out by Mr. Potter. The hot saw leaves a burr on one edge, but the new cold saw does clean, smooth work and is not very expensive.

A Pittsburg *Dispatch* reporter had a talk with a gentleman who had seen the saw at work a short time ago, and secured from him the following description of the new invention: The instrument itself is simply a circular saw of fine steel, tempered somewhat hard and about one-quarter of an inch in thickness at the periphery. It is ground slightly thinner at its center to clear itself easier in a deep cut. It is made to revolve at a slow speed, while the old hot saw was run at a high rate and did its work by means of the intense friction created rather than teeth. It cuts but one inch a minute. The machine differs from the ordinary circular saw in this respect, that it is not the work that moves up to the saw, but the work is fixed stationary and the saw is made to travel along the table through it. It is driven by a worm wheel and screw of some four or five feet in length, along which it can be moved easily by hand-screw gear or by self-acting feed gear. The saw runs in a tank of solution, and the greatest care is necessary in regard to the quality of the materials in this solution. It is made up of ten pounds of whale oil soap, fifteen pounds of sal soda, two gallons of lard oil, with water added to make forty gallons of mixture. The new saw will be used in cutting the armor plates for the government the proper size.

Russian Mercury.

Among the articles of export from Russia which are now beginning to attain a certain importance are quicksilver and phosphorus. Until quite recently Russia obtained all the quicksilver consumed by her from abroad, but since the commencement of exploitations of the mines of Bakhmut, Russian mercury is not only ousting the foreign article from the local markets, but it has become an article of export. In 1887, 7,803 poods of it were exported from St. Petersburg and Libau. In 1889, 3,150 poods of phosphorus were also exported.

The mercury mines of Saigewa, near the Nikitowka Station of the Azof Railway, prove to be exceedingly rich. The deposits contain three layers of hydrargerous ore, the total quantity of ore containing the metal being estimated at 12,000,000 poods. The ore is sprung by means of dynamite, crushed by manual labor and by crushing machines, and finally roasted. In 1889 the yield of the mines was 10,202 poods of pure metallic quicksilver. In working the deposits, traces of former workings and abandoned pits are found, showing that these same mines have already been exploited in ancient times.

Milton's Homœopathy.

Irrespective of one's views as to the several schools of medicine, it is interesting to note the fact that the poetical mind of John Milton anticipated the theory of Hahnemann, as is evinced by the following extract from his preface to "Samson Agonistes." He remarks that tragedy has power, "by raising pity or fear or terror, to purge the mind of these and such like passions; that is, to temper and reduce them to just measure with a kind of delight, stirred up by seeing those passions well imitated. Nor is nature wanting in her own effects to make good this assertion; for so in physic things of melancholic hue and quality are used against melancholy, sour against sour, salt to remove salt humors." I do not remember ever seeing this Miltonic statement of "Similia similibus curantur" commented on before.

H. C. HOVEY.

THE BROADWAY AND SEVENTH AVENUE CABLE ROAD.

(*Continued from first page.*)

locality was at the intersection of Fulton Street with Broadway. Although this is but half a mile from the southern terminus of the road, twenty-one such cross sections were plotted at intermediate points between the line of this section and the end of Whitehall Street. This fact gives a good idea of the extent of work required to determine what had to be done in the way of clearing the ground. The illustrations also show how many are the obstacles in the way of prosecuting the work.

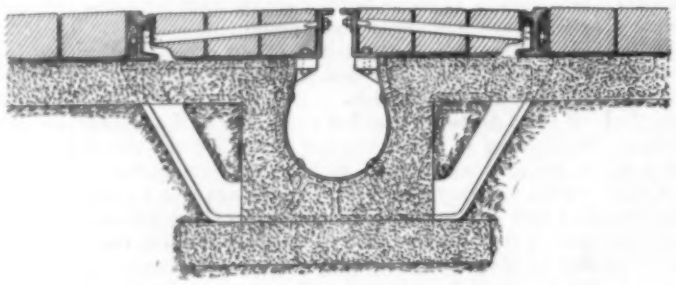
The next step in the work is the clearing of the ground. This is now in progress. For this purpose, wherever necessary, the tracks are temporarily shifted to one side, and the ground is excavated on the line of the conduits. The pipes are moved and shifted as required, so as to leave everything clear. At the present time this work is being prosecuted at many points upon the line of the road, so that no delay shall be experienced in putting the conduits in place, once the operation begins.

A careful recapitulation of the obstacles in and upon the ground at the point illustrated gives no less than twenty-five classes of incumbrances or occupants of the street, either on the surface or below it. In the category are included gas and water mains, valves for gas and water, sewers, with their manholes, basins and connections. Edison electric conduits and manholes, electric subways with their vaults, service boxes, and air pipes, commercial cable conduits and vaults, pneumatic tubes, steam pipes, with expansion joints, return pipes, valves, and valve stems, cellar vaults, and finally the horse railroad tracks. A perspective view of the incumbrances, pipe lines, etc., completely exposed as if by an excavation, produces the effect of a perfect labyrinth of cross connections and parallel lines at various depths. What the outcome of it all will be in the future it is hard to say.

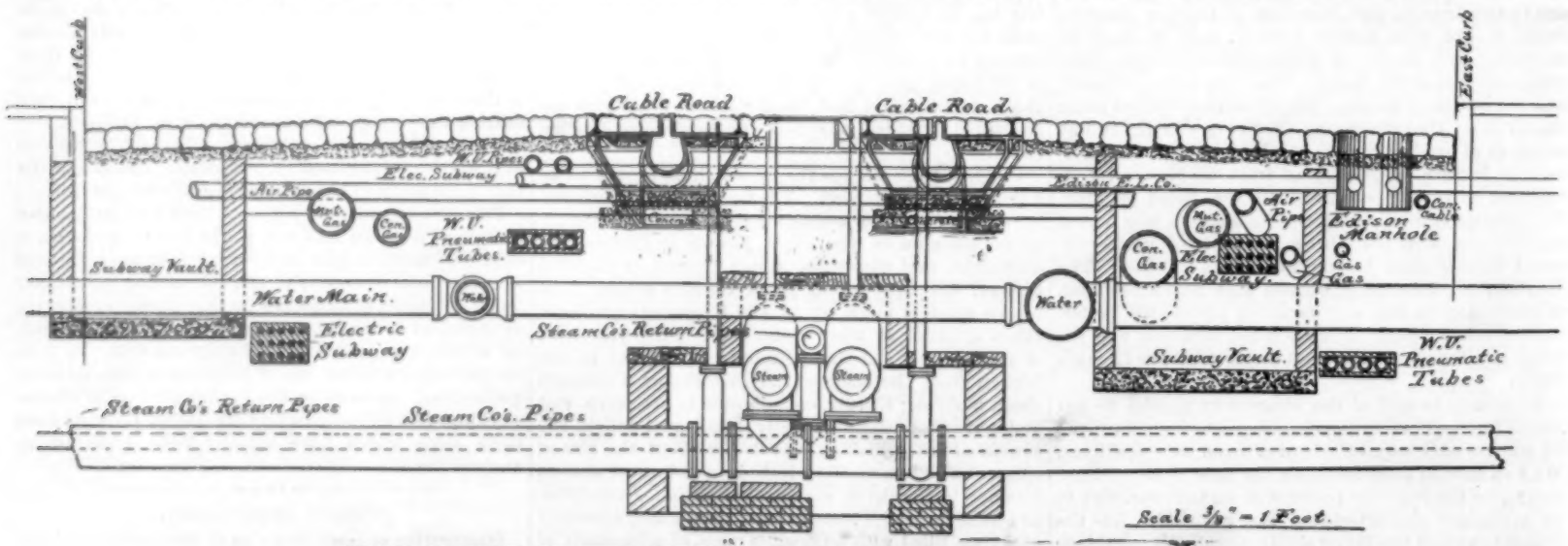
The lesson taught is obvious. To lay pipes and conduits in the earth as has been done in this city is opposed to every principle of municipal engineering. The growing complication is bringing about a condition of things which may yet lead to serious results. There is but one way to escape from the difficulty. It is to construct an adequate subway to contain the entire mass of pipe lines and possibly the sewers also. The complication is increased in many cases by the use of two or more pipes to do the work of one. If a proper subway were provided, the operations of substituting a single large duct for two or more small ones, and in general any operations tending to simplify the underground distribution of light, heat, and power, could be readily effected. The present time is most favorable for such an operation, as Broadway will soon receive a new and expensive pavement, which it would be poor policy to lay until there is no danger of disturbing it.

The original plans for the cable road contemplated an excavation of the width of the entire roadway. But it was found that this complicated operations, as the prism to be cleared was of too large section. Accordingly it has been determined to put each conduit in separately. The general construction is shown in the cuts. The slot is firmly tied, so as not to close. Improved rails are used, which will not interfere with traffic. Two power stations will probably be used, one at Houston Street and other at 51st Street. The conduit will be 24 inches deep and 15 inches wide. At intervals drainage pipes will be inserted connecting with the sewer, to carry off any water that may find its way through the slot. The engineer for the Broadway & Seventh Avenue Railroad Company is Mr. Geo. W. McNulty. The work is being executed by the contractors, John D. Crimmins & Bro., of this city.

The public will be benefited by this improvement, not only by the removal of so many horses from the street and by the improved service certain to be afforded, but the new rails will lie flush with the pavement and will have so small a groove as not to interfere with carriage or truck wheels. The question of different speeds on the upper and lower portions of the road is also a matter for consideration in the near future.



CROSS SECTION OF THE CABLE ROADWAY AND CONDUIT.



CROSS SECTION OF THE STREET AT BROADWAY AND FULTON STREET.

Electricity for Domestic Purposes.

The *Pall Mall Budget* says one of the latest adaptations of electricity to domestic purposes, in London, is the establishment of telephonic communication between the servants' hall and the other rooms in the house. There is very little expense in the installation. The common ordinary wires of the ringing bells are used without any alteration. A telephonic mouthpiece is provided at each end, and if you wish to summon the servant, you ring the bell as usual, and then speak your message to him over the telephone. The advantage to the servant is plain. It saves him or her one journey up and down stairs. Suppose you make up your mind, half an hour before your usual dinner time, to dine out, and suppose you wish to communicate this piece of intelligence to the servants. Under the present system it is impossible. You may ring, and they will jump to the conclusion that you want your dinner quickly. Give two peals, and they will only think you are in an extra hurry. You must wait till the soup is brought up, before you have a chance of putting in a single word, whereas in future you will merely have to ring the bell and then telephone, "I shall dine out. Get me a cab."

Damages for Non-Delivery of Telegram.

A distilling company sent a message to boilermakers in a neighboring city notifying them that a boiler was out of repair and asking them to "send man at once." By reason of the failure of the telegraph company to transmit or deliver the message, the distilling company was compelled to suspend operations for twenty-four hours longer than it would have done had the message been transmitted and delivered in the regular course of business. The Superior Court of Kentucky held in an action against the telegraph company that the sender of the message was entitled to recover for the additional expense incurred in feeding cattle, and the additional amount paid to hands, by reason of the delay caused by defendant's failure to transmit the message. The court said that as it was the business of the firm to which the message was sent to send men to repair boilers, it must be presumed that they would have followed their usual course of business, and it was not reasonable to presume that had the man been sent, he could not have done the work. Rich Grain Distillery Company vs. Western Union Telegraph Company.

The Tallow Tree in China.

Mr. Hosie, the British consul at Wenchow, in his last report describes a curious vegetable product which is cultivated in his district. This is the tallow tree (*Stillingia sebifera*, Roxb.), the fruit of which produces oil as well as tallow. The berries, which resemble coffee beans in appearance and size, are first steamed and then pounded in an ordinary rice trough. By pounding, the soft mealy mesocarp is partially separated from the kernels. The whole is then placed in a bamboo sieve, the meshes of which are just large enough to allow the mealy matter to be scrubbed through, and small enough to keep back the kernels, which are hard, black, and about the size of peas. From the mealy matter the tallow is expressed in primitive wooden presses. To obtain oil, the kernels are dried and passed between two millstones held at such a distance apart, by means of a bamboo pivot, as to crush the hard shells of the kernels without injuring the white interiors. The whole is then passed through a winnower, which separates the broken shells from the solid matter. The latter is then placed in a deep iron pan, and roasted until it begins to assume a brownish color, the process being accompanied by continual stirring to prevent burning. The crushed shells make an excellent fuel for the purpose. It is then ground by a huge stone roller in a circular stone well, steamed, made into circular cakes with bamboo and straw casings, and passed through the wooden press. A good lighting oil of a brownish yellow color is thus obtained. The tallow is called "p' i yu"—that is, skin or external oil.

Mysteries of Malaria.

Walter Coote, author of "Wanderings, South and East," who has been at the Fiji Islands, has the following notes upon the vagaries of what is called malaria, the strange ways of which, *The Christian at Work* adds, are often past finding out:

"I have seen Englishmen living in Fiji, on the borders of almost stagnant estuaries, with the densest and most rank vegetation around them on all sides, with mosquitoes and a hundred such insects infesting the district like a plague; in dry seasons their houses will stand in the very center of great plains of reeking ooze, in times of flood the muddy river will rise to their very verandas, and yet these people are robust and healthy. I have gone from there, and a few weeks later visited islands in the Solomon group, or New Hebrides, where I have found a dry coral soil and high land, upon which the pure trade wind blows freshly month after month, steep land, too, from which the rain water is quickly borne downward to the sea, and all this but a few hundred miles from the Fiji group, and in the same latitude, and blown upon by the same trade wind, and yet in these places it is almost death for a white man to spend more than a few months in the year on shore, and practically no one who lives ashore at all can hope to escape frequent and severe attacks of fever. In fact, it is only by being thoroughly acclimated, through a long period of time, that he can hope to live there at all."

AMONG the useful institutions of Chicago is the Watchmaker's Institute, Athenæum Building, Van Buren Street. Here, for $25 a month, pupils receive both theoretical and practical instruction in all branches of the art. The most improved tools are used, and the utmost pains taken to instruct the learners thoroughly.

ANCIENT METHODS OF DRAWING WATER

We have already described some of the ancient methods of raising water, but these were confined to the elevation of water from streams or natural bodies of water lying on the surface. For elevating water from wells and cisterns, different mechanism was required.

One of the ancient machines for this kind of work is represented in Fig. 1. In this machine a long beam weighted at one end is pivoted in a forked post and arranged to oscillate on its pivot. To the lighter end of the beam is connected a rod which is attached at its lower end to a bucket, and the weight of the heavier end of the beam is more than sufficient to lift a bucket full of water. Upon the beam is placed a plank, and at the sides of the plank are arranged hand-rails. The operator walks forward and backward upon the beam, thus alternately adding his weight to the lighter end of the beam and removing it therefrom, causing the bucket to alternately dip into the water and lift it to the surface, where it is emptied by another person. In some cases these machines are provided with steps to give a better foothold. It is said that the operator upon these machines becomes so expert that the water never ceases running in the troughs leading from the well, and still his confidence is such, notwithstanding his apparently dangerous position, that he laughs, sings, smokes, and eats in this peculiar situation. This machine is peculiar to Hindostan, and is known as the picotah.

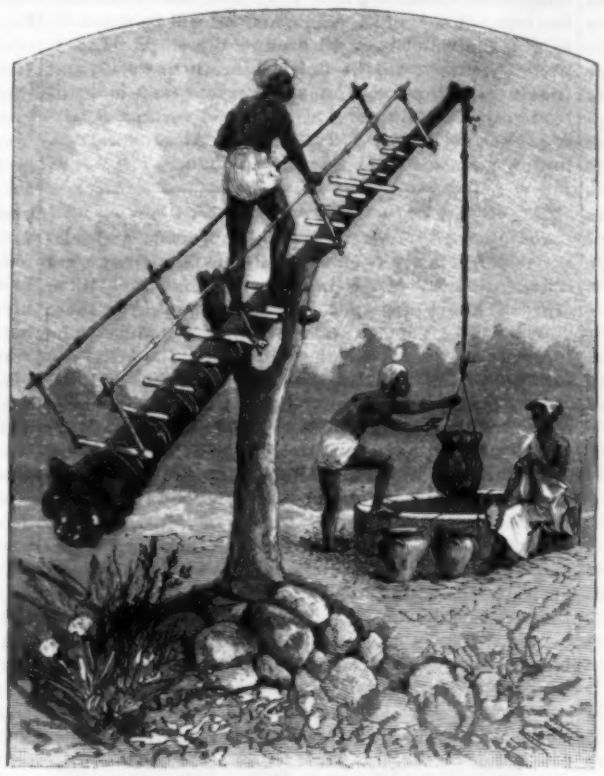


Fig. 1.—THE PICOTAH OF HINDOSTAN.

The earlier machines for raising water by power were known by such names as the tympanum, noria, chain of pots. Of these the tympanum and noria were driven by the stream from which the water was taken. The earlier form of tympanum consisted simply of a series of gutters united at their open ends to a horizontal hollow shaft placed a little higher than the discharge sluice, the gutters being arranged radially, and of sufficient length to extend from the shaft into the water. The sides were closed in by planking and the joints were made tight by calking. From the resemblance of this machine to a drum, the Romans gave it the name it bears. The tympanum shown in the engraving is an improvement on the older form, and consists of a series of tubular hollow arms extending from the periphery of a current wheel into the hollow shaft at the center. The blades of the wheel dip in the stream and are propelled by the current, and the mouths of the curved tubes scoop up the volume of water which advances toward the center of the wheel as the wheel revolves. The water thus raised is discharged through the hollow shaft into a sluice which conveys it away. These wheels are especially adapted to purposes of irrigation and mining.

The New Royal Mail Steamship Empress of Japan.

The new twin-screw steamer the Empress of Japan, which has been constructed by the Naval Construction and Armaments Company, limited, Barrow-in-Furness, has just undergone her speed trials, with the most satisfactory results. She has been built for the Canadian Pacific Railway Company, to run between Vancouver and China and Japan. She is the second of three steamers built for the same route, her sister ship being the Empress of India, while the third vessel was launched at Barrow yard recently. The builders' usual progressive runs under natural draught conditions were made on the measured mile at Skelmorlie on the Clyde, on March 30. Two runs were made with full power under assisted draught, and the mean speed realized was 18·91 knots, the engines developing close on 10,000 horse power. It is stipulated that these vessels shall run at the rate of 17½ knots on the measured mile and 16 knots on their 500 mile sea trials, these being the requirements of the contract the Pacific Company have entered into with the post office authorities. The vessel afterward proceeded on her sea trial of 500 miles, the course taken being from Wemyss Bay, on the Clyde, to Lundy Island, in the Bristol Channel, and back to Liverpool. The mean speed on this run was 16·85 knots, the mean horse power developed was 7,406, and the consumption of coal per indicated horse power 1·56.

AN International Hygienic Exhibition will be held in the months of January and February, 1892, in Leipzig. The exhibition will comprise, among others, sections devoted to hygiene, food stuffs, and ambulance.

Firing Porcelain.

The United States consul at Limoges, France, says, in his last report to the United States government, that the proprietors of the large porcelain factories there have been for a long time studying the question of reducing the price of fuel. At a recent congress of the manufacturers, it was said that some new and cheap way of manufacturing porcelain must be found for France, or the industry which has become so famous, and which employs so many of the inhabitants, would be driven from French soil on account of the cost of firing. It was there ascertained that the cost of firing china in Bohemia was not more than 10 francs a ton; in England it was only 13 francs; while, for the same thing in France, at Limoges, the cost was between 34 and 35 francs. This difference being so great, and making it impossible for the French manufacturers to make their china as cheaply as their foreign neighbors, various devices have been tried, but with little success.

In order to compete, wages have been reduced to the lowest point, and still the manufacturers are said to have lost money. The coal that is employed is necessarily costly, as a smokeless, long flame variety is required. Many of the factories burn wood only, as that produces a purer white than the very best kinds of coal, but wood is dearer than coal. It is consequently only used in firing the muffles, and in the finest grades of porcelain. A few years ago a new process was tried, that baked the porcelain in a short time, but the cost made the process impracticable. It was under such circumstances as these that one of the most progressive houses in Limoges was induced to employ petroleum or residuum oils as a fuel. To accomplish which, an American firm using the Wright burner was requested to come and make a trial with the fuel. There was very much doubt and fear connected with the experiment, but, after a time, it was attempted, and the results were far better than anticipated. The heat was shown to be absolutely pure. No gases or smoke in any way discolored the china, which came from the kiln much whiter and in better condition than when it is fired with the best of wood. In the muffles there was a decided advantage. The delicate colors, which show at once the presence of the slightest quantity of gas, were perfect. "This new discovery," says Consul Griffin, "promises to revolutionize the whole porcelain industry." It is estimated that, by employing these oils, there will be a reduction of about 15 or 20 per cent in the making of china.

The only question now is the present classification of residuum oils in the customs tariff, as the present duty on petroleum—120 francs per ton—is prohibitive, but strong pressure is being brought to bear on the government to have fuel oils classified as fuel, which pays only 1 franc 30 centimes a ton. New life is given to an industry that was seriously threatened, and it is hoped that the French porcelain will be brought to a greater state of perfection by this new American invention.

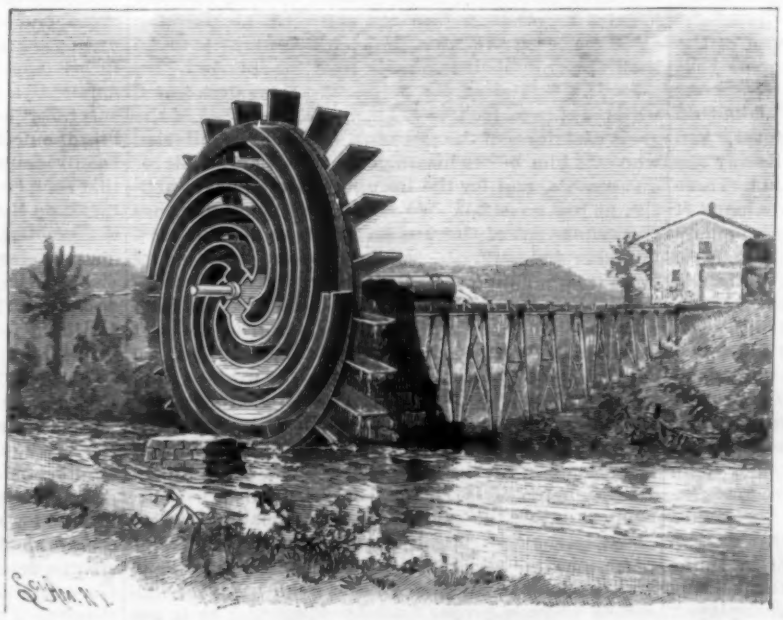


Fig. 2.—THE TYMPANUM.

Side and bearing removed to show the construction.

The Employers' Federation.

A federation of employers is in progress of organization in San Francisco, which will include the foundrymen, ship owners, lumber dealers, box makers, builders, harness and leather makers, etc. The idea is to form a federation of employers of the Pacific coast on the same plan and to be just as extensive as the organization of trades unions in the Council of Federated Trades, with its sub-federations in all parts of the coast, so that, no matter in what trade or locality the Council of Federated Trades might exert its power, it would meet an equally compact organization to oppose its decrees. It is not proposed to attempt to destroy trades unions, but to restrain them and to resist unreasonable demands; nor is it desired to reduce wages, but to so arrange matters that employers shall not be dictated to as to the individuality of employes. A committee is to be appointed, selected from the different industries, which will constitute a court of final appeal in disputes. The decision of the committee will have the power of the federation to sustain it.

Scientific and Practical Knowledge.

Some one has truthfully said that all knowledge is comprised in two classes. The first is that effect of mind which is the result of curiosity, that species of human instinct that prompts us to inquire the reason for everything we see, every action which takes place among others, among all living beings, among the elements and among the celestial bodies. Mankind being endowed with reason, the next impulse is to apply the knowledge so gained to some useful purpose, to produce some benefit to ourselves. The first of these two classes is called "scientific investigation," the second is called "applied science." For instance, we notice for the first time a light from which smoke arises, we investigate, we perceive heat, and that it produces a disagreeable sensation. These are the first scientific facts. We apply the knowledge so gained by resolving never to touch fire. This is applied science. We have employed curiosity to find out the facts. We now employ caution to guard ourselves against damage, and we determine never to touch fire. All knowledge so gained is by this process. We may be told a thousand times that fire will burn, but we feel that that is only theory. We want facts, and we obtain them by a course of scientific investigation. We use these facts and thus gain experience, knowledge, at first scientific, next practical; and these two conditions make up the sum of all knowledge. Science is the foundation, practice the superstructure.

Liquid Bronze.

Stroschein, of Berlin, makes this by treating dammar resin with about one-third of its weight of carbonate of potassium, stirring for about three days, and then finely powdering the resinous mass. Next it is scattered in thin layers on hurdles, exposed to a temperature of about 50° C., and left for several months. The resin is then dissolved in benzine or another distillate of naphtha under a boiling point of 150° C., after dry ammonia gas has been led through the solvent. The bronze powder remains suspended in this varnish. Articles bronzed with it are said to retain for years together the original fresh metallic luster.

With More Zeal than Discretion.

An esteemed contemporary announces the discovery of three "weak points" in the patent laws of the United States. It has reached the conclusion that the establishment of "oppressive monopolies" under the protection of patents ought to be effectively prohibited; the foreign inventor labors under almost insuperable disabilities in respect to the nature of proof required to establish his priority of invention in contested cases; and that patented inventions not put in public use within a reasonable time after the protection has been given, ought to be summarily deprived of it. We fear that the real source of our contemporary's disquietude is to be found in the fact that the American patent law has not been framed to meet the requirements of infringers. We may further remark that Congress appears to have no constitutional authority to change it to correspond more nearly to the views of this enterprising and industrious class of citizens. The Constitution of the United States, in express terms, empowers Congress "to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." In view of the magnificent results achieved under its stimulus by the inventors of America, it is too late to question at this day the wisdom of the fathers' provision; but whether wise or unwise, there it is, a part of our organic law, and likely to continue so. The patentee's right is *exclusive*, and though it may be limited in duration, it cannot be limited in scope. Congress has no power to step in between the patentee and his personal property, and undertake to dictate to him how, where and when he shall use it or refrain from using it. We esteem it the one crowning merit of the American patent system that the grant is unconditional and absolute, or without drawback or restriction in the nature of conditions subsequent. Two of our contemporary's points are therefore disposed of by constitutional provision. As to the remaining one, it is declared that while "it is already possible for American inventors to obtain valuable patent rights in foreign lands, ... it is well nigh impossible for a foreign inventor to secure a patent here if there can be found an American unscrupulous enough to claim the invention, naming a date prior to the foreigner's application in his own country." This is a gross misstatement of the provisions and practice of our patent law. Our rules of practice provide that he who, being an original inventor, first makes known to others within the realm (thus enabling its existence to be legally proved) the invention he has made, and perfects and seeks to patent the same with reasonable diligence, is entitled to the grant. It matters not in the least whether he be a foreigner or a native; the rule is the same. The benefit to the public, which is the consideration, and the sole consideration, for the grant, arises from the making known of the invention to the people of the United States. There is no conceivable reason why we should reward a foreigner, as of a matter of right, for something he has done in his own country and not elsewhere, unless he has, by publication or otherwise, constructively placed some person in this country in possession of a knowledge of it, and the very moment he has done this, he stands precisely on the same footing, in every particular, with his domestic competitor.

Suppose it is true that a certain proportion of the patents granted are never put to use. Suppose that some "successful" inventor has "found that progress along a certain line was barred by some old claim that has never been put to any service whatever, and neither benefits the public itself nor permits any one else to do so." How large is the proportion? There are now in force about 300,000 patents. How many of these are obstructions in the way of progress because their owners will neither use nor permit them to used? Not one-tenth of one per cent. Is it then worth while in attempting to guard against a limited and largely imaginary evil, not only to inflict incalculable injury and injustice upon the vast body of deserving inventors, but, by removing what is the principal incentive and stimulus to invention, the absolute security for a fixed term of years of patented property, to dry up, as it were, the spring of invention at its very source?—*The Electrical Engineer.*

Rebuilding while Afloat.

A novel piece of work has been undertaken in San Francisco. The ship Edward O'Brien, built in Maine in 1865, has been practically rebuilt without being taken from the water. A crew of riggers was employed, and the fore and main masts, each weighing over 100 tons, were lifted by means of shores six inches clear of the keelson. This was done without sending down the topgallant masts or any of the light yards. The lower deck stanchions were then knocked out, and the old keelson taken out the entire length of the ship, together with the sister keelsons. These were then replaced with new timbers 16 by 16 inches in size. Four of these form the keelson, and two on each side form the sister keelsons. These run the entire length of the ship, and are scarfed and keyed with oak keys. The entire skin of the vessel has been replaced, 4 by 16 planking being used. Thirteen of the lower deck beams have been taken out, and new ones, 16 by 16 inches, put in. The new keelson is fastened down with bolts 1⅛ inches in diameter and 7 feet long, which are driven 16 inches into the main keel. New chain lockers have been put into the ship, and a heavy platform carries the big water tank, holding twenty tons of water, enough to last the crew six months. New 'tween decks have been put into the craft, and the entire main deck will be taken out, together with the poop deck, forward house, topgallant forecastle, and the forward part of the cabin, and all will be renewed, as will the waterways all around the ship. It is expected the work will be finished in three weeks, and the ship will then be given a seven year class and will load grain for Europe. The estimated cost of repairing the vessel is over $40,000. R. S. Alexander & Co. have the contract.—*Pacific Lumberman.*

Natural History Notes.

The Poison of Toads.—The skin of toads and salamanders has lately been submitted to a microscopical examination by Mr. Schultz, who finds that there are two kinds of glands present in the skin of these animals, viz., mucous and poisonous glands. The former are present all over the body, the latter are confined to the back of the body and limbs and the ear region behind the eyes, and in the salamander are present at the angle of the jaw. The poison glands are larger than the mucous glands in the salamander, are oval and have a dark granular appearance, due to strongly refractive drops of poison, a good reagent for which is copper hæmatoxylin. The poison is secreted by epithelial cells lining the glands, and, when the animal is stimulated electrically, it is exuded slowly in drops by the toad, but discharged in a fine jet, sometimes to the distance of a foot or more, by the salamander. The anæsthetic action of the poison of the toad and the use to which it is put in medicine by the Chinese have already been pointed out.

Effect of Light on Spines.—In a note communicated to the French Academy of Sciences, Mr. A. Lothelier states that in *Berberis vulgaris*, *Robinia pseudacacia*, *Ulex europæus* and other plants, the formation of spines is dependent on the access of light. Plants grown in comparatively little light present very few spines, but those grown with free access of it have more numerous, more differentiated and more developed spines. M. Lothelier has observed that the loss of assimilation power caused by the development of spines is usually balanced by the stronger growth of axillary leaves.

Protective Mimicry in Spiders.—In the journal of the Elisha Mitchell Society, Mr. Atkinson calls attention to two new cases of protective mimicry in spiders. A *Cyrtarachne* takes shelter in summer and autumn under leaves, where it has absolutely the aspect of a small univalve mollusk which is extremely abundant, and which often fixes itself in an analogous position. The second example is found in a small spider, *Thomisus aleatorius*, which is remarkable for the length of its fore legs, the hind ones being, on the contrary, very short. This spider, which lives upon grasses, ascends the culm, stops suddenly and disappears from sight. It suffices to fasten itself to the spike by its hind legs, and to bring together its fore legs, extended, and forming an angle with the culm, in such a way as to make itself nearly undistinguishable from the spikelets.

The Usefulness of the Elephant.—In modern times, we have only to look to India to be convinced of the great usefulness of the elephant. To the agriculturist, who uses him before his wagon or his plow, he is indispensable, and for the transportation of heavy articles he has no rival. We see him carrying immense tree trunks out of the Indian forest, and by his indefatigable industry, in picking up and carrying off large stones, aiding the construction of roads and railways. For labor of this kind a coolie receives from four to eight annas, while five and six rupees are paid for the daily work of an elephant. From this fact we conclude that one elephant performs the work of from twelve to twenty-two coolies. From the record of the British expedition against King Theodore, of Abyssinia, in 1868, we learn that 44 elephants were shipped from Bombay for use in the campaign. Each animal was in charge of two men. Of this number, five succumbed during the campaign. The remaining 39 rendered valuable services, being intrusted with the transportation, through a mountainous country, of cannon, ammunition and supplies. It was frequently very difficult to procure proper food for them, and as it was often necessary to traverse great distances to reach the watering places, the death of the five animals is ascribed to these hardships. Although elephants move slowly through a mountainous country and soon become footsore, they performed their task with admirable faithfulness. Without them it would have been necessary to await the building of wagon roads.

Green Butterflies.—"Grant Allen shows," says Mr. W. Doherty, in the journal of the Asiatic Society, of Bengal, "that, while greenish flowers are among the oldest, really green flowers are the most recently developed of all and among the most conspicuous. Very much the same thing is true of Lepidoptera. Pale green moths, like Actias, Geometra, and Pachyarches, are protected by their coloring, which is common to both sexes, and are quite hidden when nestling among the leaves. Such seems also to be the case with *Lehera eryx*, a lycaenid which is greenish on the under side, and may possibly be the case with some Catopsilias. But bright metallic green is, I think, the latest developed color among butterflies, and decidedly the most conspicuous. No one who has not seen it can imagine the brilliancy of *Arhopala farquharii* or *Ornithoptera brookeana* in the greenest jungle. The brightest of the metallic blue butterflies look dim beside them. It may be confidently asserted of all such butterflies that, unless the species is protected, only the male is green. The protected Ornithopteras have sometimes assumed green colors as well as golden and orange, and the female shares in this useful ornamentation to some extent. In non-protected butterflies the green is confined to the upper side, and is quite invisible except during flight. In the Lycaenidae it is found in many Zephyri, in some Poritias and Massagas, in a few Arhopalas, and in *Lampides marakata*, a rare butterfly I discovered in the Malay Peninsula, and named after its emerald tint above. Among all these, whenever the female is known, it is blue, orange, black, violet, or any other color but green. The conservative and, in butterflies, unadorned sex has not yet acquired the latest development in colors. It is also remarkable that the green colors seem to occur where the genus is most dominant. The Malay Peninsula and Borneo form the great center of development of the genera Arhopala and Lampides, and it is there that most of the green species occur. The outlying Arhopalas, those of the northwest Himalayas, and the Timorian islands, are all blue. In Zephyrus, the green species are found only where the genus is best represented and most vigorous. *Zephyrus pavo*, a species found in the Bhutan and Assam hill ranges, remote from the regular habitat of the genus, has, I discovered, the male blue and greatly resembling allied females from the western Himalayas. The green and orange Ornithopteras also occur only in the heart of the Ornithoptera region. These remarks on green butterflies also apply in some degree to certain other unusual colors of great brilliancy, such as the shining coppery gold of *Ilerda brahma* and the fiery red of *Thamala marciana*. It ought to be borne in mind that such colors must never be ascribed to a female without careful examination."

The Phenomenon of Autotomy in Certain Animals.—Mr. Fredwicq, of Liege, has established the fact that the amputation of the claws in the crab is a reflex phenomenon with which the will of the animal has nothing to do, and which is always brought about by an excitation affecting one of the articulations of the limb sacrificed. He has shown, too, that lizards suspended by the tail never succeed in breaking it, if bruising of this organ be carefully avoided. He concludes therefrom that, in these animals, autotomy is again dependent upon a reflex act, and he places in this category all the cases of mutilation, apparently voluntary, that are presented by insects, worms, echinoderms, etc. At a recent session of the French Academy of Sciences, Mr. Charles Contejean gave an account of some experiments that he has just made upon the grasshopper and lizard, and that permit him to bring new proofs forward to the support of this opinion. He has found, among other facts: (1) That autotomy cannot be induced in grasshoppers and in lizards enfeebled by long fasting; (2) that lizards artificially chilled can no longer break off their tails: (3) that such breakage is so much the more easy and more rapid, on the contrary, in proportion as the animal is more active; (4) that in the lizard, as in the grasshopper, electric excitation is that that gives most success; (5) that autotomy is more easily induced in a decapitated lizard than in an intact animal, the moderating action exerted by the encephalus being suppressed.

Superimposed Magnetizations.

Experiments by M. Jamin have shown that two longitudinal magnetizations of inverse polarity may be imposed on a piece of steel without mutual neutralization. The same has been shown by M. Decharme to be true for transverse magnetization, and in a recent communication to the Academie des Sciences, M. Decharme describes the result of magnetizing the same piece of steel successively, longitudinally and transversely. The specimen of steel was 100 m.m. long, 28 mm. broad, and 3 mm. thick. If the conditions were favorable and care was taken, it was found possible to obtain an iron filing sketch, showing two simultaneously existing magnetizations. In most instances, however, the two magnetizations were merely superimposed, and by making the proper passes the longitudinal and the transverse magnetizations could be made to predominate in succession, and with increasing strength, until saturation point was reached. A bar magnetized first longitudinally and then transversely would thus appear to be in a state of magnetic instability.

Periodical Locusts.

In reply to one of our correspondents who asked information concerning these insects, Dr. C. V. Riley, to whom we referred the inquiry, says:

"In reference to the 17-year locust, or periodical cicada, I may say that in more northern localities the insect appears once in 17 years in a given location, while further south it occurs once in 13 years. In other words, there are two distinct races, one called *Septendecim* and the other *Tredecim*, according as they appear either in 17 or 13 years. There are, however, a number of more or less well marked broods, according to locality. Of these I have tabulated 22, and have indicated in Bulletin No. 8 of the Division of Entomology and in the Annual Report of the Department of Agriculture for 1885, and also in other writings, the exact territory which each of these 22 broods occupies. The State of Indiana has 5 broods, viz., 1885 (XXII), 1888 (V), 1889 (VIII), 1893 (XI), and 1894 (XII). The next brood to appear in Indiana is brood XI, in 1893. The last occurrence of this brood was in 1876, and in that year I had no authentic accounts from Indiana. In 1842 and 1859, however, its appearance was recorded in Sullivan and Knox Counties. In 1894 brood XII will appear. Here again I received no records from Indiana in 1877, but in 1843 and 1860 it was recorded in Dearborn County. The largest brood which Indiana has is XXII, which appeared in 1885, and is due again in 1902. It occupies the entire southern part of the State. This brood is well recorded in Indiana as far back as 1834.

Destruction of Chinch Bugs.

BY F. H. SNOW.

At the recent meeting of entomologists at Champaign, Ill., Dr. F. H. Snow read an interesting paper on the above subject. His experiments have been continued through the two seasons of 1889 and 1890, and have been remarkably successful. As entomologist to the Kansas State Board of Agriculture, I had prepared an article for the annual meeting of that board in January, 1889, stating what was known at that time upon the subject, and calling attention to the investigations of Professors Forbes, Burrill, and Lugger. In June, 1889, a letter was received from Dr. J. T. Curtiss, of Dwight, Morris County, Kansas, announcing that one of the diseases mentioned in the article (Entomophthora) was raging in various fields in that region, and stating that in many places in fields of oats and wheat the ground was fairly white with the dead bugs. Some of these dead bugs were at once obtained and experiments were begun in the entomological laboratory of the university. It was found that living, healthy bugs, when placed in the same jar with the dead bugs from Morris County, were sickened and killed within ten days. A Lawrence newspaper reporter, learning of this fact, published the statement that any farmers who were troubled by chinch bugs might easily destroy them from their entire farms by sending to me for some diseased bugs. This announcement was published all over the country, and in a few days I received applications from agricultural experiment stations and farmers in nine different States, praying for a few "diseased and deceased" bugs with which to inoculate the destroying pests with a fatal disease. Some fifty packages were sent out during the season of 1889, and the results were in the main highly favorable.

It was my belief that sick bugs would prove more serviceable in the dissemination of disease than dead bugs. I accordingly sent out a circular letter with each package, instructing the receiver to place the dead bugs in a jar for 48 hours, with from ten to twenty times as many live bugs from the field. In this way the disease would be communicated to the live bugs in the jar. These sick bugs being deposited in different portions of the field of experiment would communicate the disease more thoroughly while moving about among the healthy bugs by which they would be surrounded. This belief was corroborated by the results. The disease was successfully introduced from my laboratory into the States of Missouri, Nebraska, Indiana, Ohio, and Minnesota, and into various counties in the State of Kansas. A report of my observations and experiments in 1889 has been published in the Transactions of the Kansas Academy of Science, vol. xii., pp. 34-37, also in the Report of the Proceedings of the Annual Meeting of the Kansas State Board of Agriculture, in January, 1890.

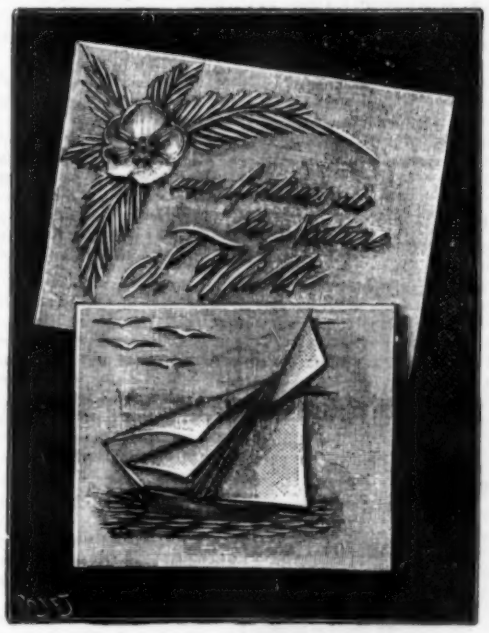
The next point to be attained was the preservation of the disease through the winter in order that it might be under my control and be available for use in the season of 1890. To accomplish this result, I placed fresh, healthy bugs in the infection jar late in November, 1889, and was pleased to note that they contracted the disease and died in the same way as in the earlier part of the season. I was not able to obtain fresh material for the purpose of testing the vitality of the disease germs in the spring of 1890 until the month of April, and then only a limited supply of live bugs could be secured.

The chinch bug seemed to have been very generally exterminated in Kansas in 1889, and only three applications for diseased bugs were received in 1890 up to the middle of July.

CASTROGRAPHY.

Do not look for the word *castrography* in the dictionary, for it is a neologism created to designate a new art. Castrography (from the Greek, meaning to write by cutting) consists in writing or drawing in relief in the substance of a sheet of thin cardboard, by means of the blade of a penknife. It was devised by Mr. Mills, an American, who exhibited the process at Paris in a public establishment. This artist traces the drawing or writing by means of incisions made in the substance of the card. As the knife blade makes a very sharp angle with the card, these incisions may be very deep. In measure as they are made, the operator, with the back of the blade, raises the upper part that he has just cut, so that its outline is at once converted into a sort of bass-relief. On illuminating the card, thus prepared, sideways, it exhibits, in fact, the high lights, tones and half tones and the true and projected shadows of sculpture. As for the rapidity of execution, it will suffice for us to say that the specimens prepared specially before our eyes by the artist, for the readers of *La Nature*, were executed in less than a minute by the watch. (See accompanying figure.) Mr. Mills varies the style of his delicate compositions *ad infinitum*. Here we see flowers, such as eglantines and forget-me-nots, here ornamental designs, and here again birds, ornamental plants, etc., rising suddenly under the blade of the rapid knife. In the time that it would take a draughtsman to put a sketch upon paper, Mr. Mills gives us not only the contour, but also the shadows, obtained by the play of light upon the bass-relief.

This process is scarcely capable of furnishing anything but fancy work, visiting cards, bills of fare, out of the ordinary line of decoration, etc. A goodly number of our readers who are fond of manual recreations might practice it in their turn. They will find that it is very difficult to incise a sheet of Bristol board without the knife's point passing clear through it, but we believe that with a little exercise, and provided they do not try to work too fast, they will be able to obtain satisfactory results.—*La Nature.*



BASS-RELIEFS MADE IN CARDS WITH THE BLADE OF A PENKNIFE.

A Remedy for Cut Worm.

Cut worms are the caterpillars of night-flying moths. Most of them are very injurious to young and tender plants, such as cabbage, tomato, peppers, corn, beans, etc. They only work at night, and during the day remain hidden just under the surface of the ground in the immediate vicinity of their food plants or pastures. Many of the species climb trees, and often become very destructive to the expanding buds and young foliage. The moths of the species that infest our gardens usually lay their eggs near the roots of perennial plants, such as rhubarb, hollyhock, etc., and in the vicinity of such plants we may confidently expect to find plenty of young cut worms in spring. One of the easiest ways to get rid of the pest, says a correspondent in *Popular Gardening*, is to scatter pieces of green stuff, cabbage leaves, or sods with fresh grass, etc., that have been sprinkled with Paris green water, here and there over the area that we wish to clear of cut worms. Hand picking is a more laborious remedy, but it can be made effective. Plow the field, a few weeks before the intended crop is to be planted, and sow some beans over the piece. After the beans are up, the patch should be gone over early every morning, and the cut worms hunted up near the freshly cut plants, and destroyed. If this is done for a week or so, there will be few worms left to trouble the crop to be planted afterward. The worms can also be starved out of a piece of land or orchard by growing several successive crops of buckwheat on it, and allowing no other plant or weed to grow for an entire season. When mature, the larva enters the ground, where it forms an oval smooth cavity, within which it changes to a chrysalis of a deep mahogany brown color, pointed at the extremity. These chrysalides are often turned up in large numbers when the ground is plowed. Birds of all kinds, and even domestic fowls, are very fond of these chrysalides (as many of them are also of the larvæ), and many are thus destroyed by their enemies, to whose view they are exposed by the plow.

A Electrical Wedding.

At a wedding reported in Baltimore, a few days ago, no sooner had the company been comfortably seated than the room burst into a flood of light from numerous varicolored incandescent electric lamps hidden among the decorations. The entrance of the bride and bridegroom was welcomed by the automatic ringing of electric bells and the playing of electrical musical instruments. After the first course, the room was plunged into semi-darkness, when suddenly, from the floral decorations upon the table, there glowed tiny electric lamps. Not only the flowers, but the interior of the translucent vases in which some of them were gathered, scintillated with flashes of light. After a while a miniature electric lamp, which in some unexplained manner had attached itself to the bride's hair, was seen to glow with dazzling brightness. A toast having been given, two serpents slowly uncoiled themselves and issued from the wine bottle that stood beside the bridal couple. Cigars and coffee were served, and the cigars were lighted by an electric lighter, while coffee was prepared in full view of the company by an electrical heater. The speeches that were made were liberally applauded by an electrical kettledrum placed under the table. As the company dispersed, the electric current set off a novel pyrotechnic display, amid the crimson glare of which the festivities ended.

Caterpillars Stop Trains.

The Carolina Central runs through the Big Swamp just east of Lumberton on trestlework, broken here and there in the solid portions of the swamp by embankments of earth. On April 28 an army of caterpillars began moving out of the swamp, and when they reached the streams, they proceeded to cross on the trestles. The rails and ties were covered several inches deep with the moving mass, and the first train that encountered them was brought to a standstill, the driving wheels of the engine slipping around as if the rails had been oiled. The engineer exhausted the contents of his sand box before he got through the swamp and reached a clear stretch of track.

It was thought that trip would be the end of the caterpillar trouble, but the next day a train encountered another army of caterpillars crossing the trestle, and had the same difficulty. The Charlotte-bound passenger train recently had a similar experience. The rails and cross ties of the trestle were hidden from sight. Where the caterpillars came from is not known. The farmers on this side of the swamp express no uneasiness for the safety of their crops so long as the advancing army persists in using the trestle in getting across the streams, for none of them have got more than half way across before being overtaken by a train.

Preserving Plants.

Mr. J. Sauer has made known a process for preserving plants in the form and with the flexibility that they possessed in the fresh state, and also for coloring or bronzing the plants thus prepared.

The plants having been perfectly freed from dust, and washed, are immersed for two or three days in a strong solution of crystals of soda. The strength of the solution usually employed is eighteen ounces of crystals to one quart of water. Sometimes it is advantageous to add a little caustic lixivium.

The plants are dried between cloths for three or four hours, and are then greased either by immersing them in melted lard or by gently rubbing them with the hand with olive oil.

To color the plants thus prepared, they are painted with a solution of dextrine containing a proportion of about five per cent of solution of aloes. To this coating are applied the proper colored powders.—*Moniteur Scientifique.*

THE activity and originality shown in connection with the recent development of the American navy affords material for thought, not only to our shipbuilders, but also to our statesmen. Notwithstanding this activity, we sincerely hope that the two great English-speaking nations of the world will never disgrace civilization by going to war with each other. We may say, frankly, that we should have preferred to see America content in developing her industrial and mercantile resources. Since, however, she seems determined to take a position as a naval power, it is the evident duty of our statesmen to make themselves thoroughly acquainted with American naval progress, and to take steps to guard against possible contingencies.—*Industries, London.*

RECENTLY PATENTED INVENTIONS.

Engineering.

TRACTION ENGINE.—Mr. John H. Crumb, of Burlingame, Kansas, has patented an improved traction engine in which all the wheels are used as traction wheels, and in which the steering may be effected in the usual way by the turning of the wheels which are pivoted; or, if desirable, the engine may be moved off bodily in any direction without turning. This construction affords peculiar advantages for many uses, such as ditching, plowing and other agricultural operations.

VALVE GEAR FOR STEAM ENGINE.—Mr. Wilber J. Cunningham, of Rapid City, South Dakota, has invented an improved valve gear for steam engines, which insures a quick opening and closing of the ports at the proper time in the stroke, thereby securing a more effective distribution of the steam than is obtained in engines of ordinary construction. The engine is provided with a cam on the main shaft, and rock shafts carrying arms having rollers which are engaged by opposite sides of the cam. The slide valves are arranged to move in a line at right angles to the axis of the engine.

HEATING APPARATUS.—Mr. Cyprien Dubé, of New York City, has patented an improved steam or hot water heater designed principally for warming buildings, and capable of being used to good advantage for generating steam for motive power, or for heating water for various purposes. The heater is provided with a double shell forming water chambers at opposite sides of the fire box, which are connected by transverse tubular water chambers at the front and rear of the fire box. The water grate is supported by transverse water tubes arranged alternately between the grate tubes. In the upper portion of the double casing is suspended a fire tube boiler which connects with the steam space in the top of the double-walled fire box.

RADIATOR.—Mr. Charles E. Marston, of Dover, New Hampshire, has patented an improved radiator consisting of hollow superimposed sections, each formed with inclined walls, and with upwardly and downwardly extending flanges around the central opening, the lower flanges of each section fitting within the upper one of the next section. A detachable open-ended tube seated upon the upper section is held by a nut screwed on the lower end of the tube and bearing against the lower section. The construction of this radiator is such as to convey the water of condensation downward without leakage.

RAILROAD SPIKES.—An improved railroad spike has been recently patented by Messrs. Walter J. Hammond and John Gordon, of Rio de Janeiro, Brazil. This spike is provided with a head having a beveled edge furnished with a series of steps adapted to successively engage the edge of the base of the rail when the spike is driven farther after it has become loose.

STEERING APPARATUS.—An improved steam steering apparatus has been patented by Mr. Joseph B. Brolaski, of St. Louis, Mo. This improvement is designed to be used on a class of steamboats propelled by independent side wheels worked by independent engines, the object being to steer the vessel independently of the rudder. In steering by a rudder, the point of pivot is at the bow, but by steering with independent paddle wheels the point of pivot is amidships, allowing of turning the vessel much quicker than is possible with the ordinary steering apparatus. The invention consists, in combination with the steam supply pipes of the two engines, of valves provided with weighted valve levers, and a beam pivoted on one of the posts of the steering gear and connected at opposite ends with the valve levers, the beam being arranged so that it may be raised or lowered to open or close both valves simultaneously, or tilted so as to open one valve and close the other as required in steering.

Railway Appliances.

RAILROAD TIE.—Bridges Smith, Macon, Ga. This tie is made of metal, rectangular in form and hollow, and has produced thereon depending points or teeth. A plate having upwardly turned edges fits in the body of the tie and constitutes its bottom, thus adapting the tie for use at points where water is liable to find outlet through the railroad, the water passing through the tie.

Mechanical.

SCREW CUTTING MACHINE.—An improvement in screw-cutting machines has been patented by Messrs. Henry Westbrook and Robert Burns, of Woodstock, Canada. This improvement relates to the chuck holding the cutters. The chuck is divided into two equal parts, each carrying a pair of adjustable cutters, the parts being mounted on a face plate in such a manner as to permit of their being separated when the screw is to be discharged by the dies or cutters. The two parts of the chuck are held in the position of use by levers which are operated by a cone on the mandrel of the machine, and the parts when released by the movement of the cone are separated by spiral springs.

PROCESS OF MAKING BRUSHES.—Martin C. Pankey, Scranton, Miss. This is a process of forming brushes from blocks of wood having fiber embedded in a pulp, saw palmetto for instance, and consists in softening the pulp by means of moisture, loosening and detaching the pulp from the fiber by combing on both faces of the block, drying the combed block, and then sawing through the solid part of the block.

FEEDING ATTACHMENT FOR TAN PRESSES.—Albert F. Jones, Salem, Mass. The press crib has an opening in its bottom near its rear side, in which revolves about one-half of a feed roller, and in front of a front opening in the crib revolve a pair of pressure rolls. Rearwardly inclined shafts enter the crib at its rear, geared for rotation at their lower ends and carrying within the crib three-armed agitators, which prevent bunching of the shavings.

INSULATING SWING JOINT.—Henry P. Drew, New York City. This device is designed for use when gas and electric light fixtures are mounted together and supported by the swing joint. Electrical insulation is provided in the flexing joint so as to prevent escape of electricity, and the joint is otherwise so constructed as to afford means to freely conduct gas either in a straight line or at angles.

DRILL BIT.—Robert McKee, Meeker, Col. This drill has lengthwise grooves on opposite sides gradually decreasing in depth from the upper end to the point of the drill, and in the grooves slide broad-pointed, wedge-shaped arms pendent from an annular collar fitting on a threaded sleeve on the bit shank, the arms being held in place by a circular band. The bit is adapted to be enlarged by screwing down the drill tube, which expands the arms on the collar.

LOCK FOR VEHICLE DOORS.—Paul Sobege, Paris, France.—This device comprises an air-compressor located on or near the driver's seat, and operated by an oscillatable lever, the air passing by pipes to a dilatable reservoir. The latter as it expands depresses one end of a lever, the other end of which actuates a series of levers, which cause the release of a pawl from the cam-shaped locking bolt, which disengages from the door, allowing the door to open.

BEVEL GRINDING MACHINE.—Eugene Homan, New York City. This machine is for cutting and polishing bevel edges on plates of glass used for mirrors and other purposes. Standards are erected on a pair of elongated horizontal shears, and a platen swings on the standards near its center of height. The platen carries a pair of bracket arms each loosely supporting a pendent fork piece, the standards having flanged nuts and screws therein having radial collars embracing the fork pieces.

Electrical.

REGULATOR FOR ELECTRIC LAMPS.—Messrs. C. H. Baisley, Jr., and E. M. Porter, of Connellsville, Pa., have patented a current regulator for incandescent electric lamps, by means of which the light may be increased or diminished at will. The invention consists of a switch provided with a number of sections, each section being provided with resistance which is cut out or put in the circuit by turning the switch. By means of this invention an incandescent electric lamp may be turned up or down in much the same manner as gas.

ELECTRICAL RAILWAY POLE.—An electric railway pole has been recently patented by M. Foster Milliken, of New York City. The object of this invention is to furnish a simple and economical means of bracing the cross arms of the poles against lateral strain, so that the arms will be prevented from bending to too great an extent when the wires supported by the arms are drawn very tight. The invention consists in horizontal bars secured to a mast and located at right angles to the arms, and independent brace arms arranged in diamond form around the mast and secured to the side arms.

Optical.

TINTOMETER.—Mr. Joseph W. Lovibond, of Salisbury, England, has patented a "tintometer" for the examination of translucent matter for color intensity and of opaque matter for superficial color structure or texture. A patent was granted to the same inventor May 31, 1887, for a monocular instrument of this kind. The present improvement consists in making the instrument binocular, so as to afford a better view of the matter under examination and of the standard to which it is referred.

Agricultural.

CULTIVATOR AND FERTILIZER DISTRIBUTOR.—A combined cultivator and fertiliser distributor has been patented by Mr. Lehman B. Buxby, of Mauricetown, N. J. This machine is provided with shares or hoes, and is designed to act as a furrower, marker, and ridger, in addition to its regular uses. It is provided with an attachment whereby the team is used for lifting the plows out of the ground, thereby relieving the driver. The machine is compact and simple, and well adapted to the use for which it is intended.

FOOT FOR PLOW STOCKS.—William B. Brown, Headsville, Tex. Two forwardly-curved bars are clamped to the beam of the plow, and a heel is rigidly secured at its forward end between the lower ends of said bars, the rear end of the heel being bent upward and forward, and secured between the said bars above its forward end. The foot thus has few parts, and is strong and durable.

CULTIVATOR, PLANTER, AND FERTILIZER DISTRIBUTOR.—Edwin C. Worrell, Murfreesborough, N. C. A rectangular frame formed of sections of gas pipe is mounted on supporting wheels and a vertically adjustable supplementary frame is hung thereto and supports the cultivating, distributing, and planting devices. The pulverizing disks below the hopper are mounted on a shaft pivoted at one end in the supplementary frame, and said shaft may be swung diagonally to the line of draught and steer the machine.

Miscellaneous.

SCRIBER.—William Potter, New York City. On a base carrying an equalizing plate or turn table is a movable post, parallel rods being pivoted to the equalizing plate and to the post, while a scriber arm is attached to the post, and a socket adjustable upon the arm is adapted to receive a pencil or other marking implement. The device forms a tool of simple and durable construction, capable of use either right or left.

MAGAZINE GUN.—Charles J. Wahlquist, Assiniboine, Montana. This gun has an aperture extending through it from side to side at a downward incline in which a cartridge holder is adapted to slide in and out, with means for securing the holder in firing position in the aperture. The cartridge chambers act as firing chambers, and when the cartridges have been discharged, the holder may be quickly replaced by a filled holder. The arm may also be made for use as a single breech loader, and when used as a magazine gun is designed to facilitate very rapid firing without lowering the gun from the shoulder.

CHECK PUNCH.—Lloyd M. Mills, Grand Rapids, Mich. This is a device to cut or punch a desired numeral or figure out of a check, draft, etc., so that the several numerals or figures stand in perfect alignment. Die rods are adapted to slide toward and from a common center on a die wheel turning below the rods and actuated from the latter, so as to bring the corresponding die of the die wheel in line with the actuating rod having a corresponding die. The construction is simple and durable and the device is easily and quickly manipulated.

VEHICLE FIFTH WHEEL.—Alfred W. Johnson, New Brunswick, N. J. The attached fifth wheel section provided by this invention is mainly circular on its exterior margin, but eccentric on opposite sides in front, forming angular protruding shoulders, in combination with an outer section attached to the body of the vehicle having eccentric set-off spaces and shoulders, and adapted to receive the fifth wheel section attached to the running gear loosely within it, with freedom to turn and move backward and forward therein. With this construction the draught pole or thills cannot move laterally, or the truck axle be turned when being drawn ahead, without causing the load to be moved forward relatively to the running gear.

VELOCIPEDE.—William Blakely, Vernon, Bournemouth West, England. This is an improvement in foot rests for bicycles and tricycles, to diminish the shocks and jars transmitted to the legs of the rider when descending steep hills at high speeds with the feet on the rests. There are guides on the fork or frame permitting up and down motion of the foot rest, while a spring upholds the foot rest in the guides and affords an elastic support for the rider's feet.

HANDLE FOR BICYCLES.—This is another invention of the same inventor of a handle to absorb or neutralize the jarring or tremulous motion ordinarily transmitted to the hands and arms in operating a machine. In recesses in the ends of the hands are elastic bushings of conical form, interposed between the handle and its tang, the bushings being compressible by end pressure, while elastic washers are interposed between the ends of the handle and abutments on the tang by which the handle and the bushings are held in place.

CAST IRON SINK.—George H. Shattuck, Medina, N. Y. This sink has a top flange with thickened corners, the thickened portions being beveled downward from the miter line to the flange and toward the inner edge of the flange, the object being to make a sink which will bear rough handling in storing and shipping, and yet of lighter weight than is now customary, the metal being so disposed as to withstand shocks, while less metal than heretofore used is employed.

TONGUE FOR EARTH SCRAPERS.—Samuel R. Licklider, Everett, Mo. In the construction provided for by this invention, brace bars bolted to the tongue extend beneath the hound bars, to the inside of which they are bolted at their rear ends, so as to strengthen and stiffen the hounds, and co-operate with the scraper and other working parts, preventing the working mechanism from becoming jammed or accidentally locked. The device is also applicable to wagons and sleighs.

BIER.—Wiltshire Sanders and John B. Rafferty, Reno, Nevada. This is an improvement in folding or collapsible biers provided with casters to adapt them to be easily moved. The frame has side bars with internal longitudinal grooves, in combination with a hinged and folding leg and brace therefor, while the rectangular ends of a transverse bar enter the grooves and are adapted to slide or lock therein as the bar is turned or adjusted.

FIRE ESCAPE.—Henry Vieregg, Grand Island, Neb. Brackets on the face of the building support a rod from which depends a movable hanger carrying a sheave pulley, over which passes an endless chain wound upon drums in the cage of the device, the cage being preferably of metal. Attached to one of the drum shafts in the cage are friction wheels, adapted for engagement by brakes pivoted in the cage. The device may be readily moved to any window from which a person desires to escape, and the speed of the descent is readily controlled.

BOTTLE CAPPING.—Louis Picard, Rheims, France. This is a bottle-wiring and capsule-removing device for champagne and similar bottles. A three-branched frame is made to embrace the bottle neck and cross the cork, a strand uniting the lower ends of the branches and having one end free, while two capsule-removing strands extend from the point where the end of the base strand opposite its free end joins the adjacent branch, with which it is integral. With this fastening the cork is released by a single pull, the cork then being removed by the gaseous pressure or otherwise.

INDICATOR AND ADVERTISING DEVICE.—Edward C. Smith, Oskaloosa, Iowa. This is designed especially as a convenience for barber shops, etc., the frame supporting spaces for advertising cards, and having near its bottom match and broom holding receptacles, while near the top is a space for a clock, and in the rear is a wheel and ratchet mechanism, operated by a pull cord, whereby successive numbers are displayed through suitable openings, a gong or bell ringing as the cord is pulled.

BILLIARD CUE.—William S. and Thomas Thompson, Townsend, Montana. This cue has an externally threaded sliding sleeve on its forward extremity, an outer sleeve rotating therein, in the forward end of which is an adjustable tip, whereby, when either the cue or the rotary sleeve is rotated in the proper direction, the sliding sleeve will bear on the inner end of the tip and force it outward. The construction is designed to largely extend the durability of the tip, so that it need be renewed only at long intervals.

TWINE HOLDER AND CUTTER.—Messrs. J. J. Quinn & F. C. Snebold, of Deming, New Mexico, have patented an improved twine holder and cutter, which is designed to conveniently hold spooled or bunched twine, and to give the twine the amount of tension required. The device is provided with a cutter of peculiar form fastened on the spindle of the spool. The cutter is formed so that it may be readily sharpened by grinding.

BANJO.—An improvement in banjos, designed to increase the resonance in the instruments, and give them a full, heavy, clear, distinct and bell-like tone, has been patented by Messrs. J. M. Smith & G. J. Fritz, of Butler, New Jersey. The banjo is provided with a split or sectional resonant ring supported by studs projecting from the edge of the rim. The resonant ring forms a bearing surface for the periphery of the head. The members of the ring are spaced and bolted or riveted together, and the head stretched tightly over the ring by the use of the usual hoop and hook screws, or in any other suitable way.

MARINE VESSEL.—A fireproof vessel has been patented by Joseph B. Brolaski, of St. Louis, Mo., in which the walls and ceiling are formed by metal sheets, and wooden parts wherever they are employed are covered with sheet metal. The metal sheets used for partitions are applied alternately to opposite sides of the wooden uprights, thus forming panels. The edges of the metal sheets are bent around the uprights.

The same inventor has patented a novel water-tight compartment for vessels, which is designed to provide against the sinking of a vessel should it spring a leak. The compartment when open will permit of the ready handling of the cargo and will not interfere with its safe stowage.

WASHING MACHINE.—Mr. John A. Van Winkle, of Denison, Iowa, has patented a washing machine consisting of a tub with a frame mounted therein and provided with a series of rollers, uprights being fixed to the corners of the frame so as to move vertically in ways in the sides of the tub. The uprights have series of holes for receiving wires for holding the uprights and rollers at any desired elevation. The machine is provided with a bent lever connected at one end with oscillating arms and having at the other end a handle. To the bend of the lever is pivoted a roller provided with a rubber adapted to move over the roller.

SCIENTIFIC AMERICAN BUILDING EDITION.

MAY NUMBER.—(No. 67.)

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3. Design for a staircase of pleasing and novel appearance.
4. Photographic views and floor plans of a colonial cottage in Armour Villa Park, Bronxville, N. Y. Cost $2,800. W. W. Kent, architect, New York.
5. Engravings showing a perspective and floor plans of the residence of Mr. George Burnham, at Powelton Ave., Philadelphia, Pa.
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7. A dwelling at New Haven, Conn. Cost complete $6,345. Perspective view, floor plans, etc.
8. Illustrations showing perspectives and ground plan of the First Presbyterian church, recently erected at Rutherford, N. J. Total cost complete $70,000. Messrs. Fowler & Hough, New York, architects.
9. A very attractive and picturesque cottage erected at Wayne, Pa. Cost $5,800 complete. Floor plans, perspective elevation, etc.
10. A cottage at Fanwood, N. J. Cost $4,300 complete. Photographic view, floor plans, etc.
11. Sketch showing the new "Empire Theater" of Philadelphia, Pa., designed to be one of the most commodious play houses in America. Architect Augus S. Wade.
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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3020) R. G. W. asks: Can you give me any test to know when any gold remains in a worn-out cyanide of gold bath, without the troublesome way of evaporating? A. You might test it by trying if it will deposit any gold upon a clean surface of silver. Or add solution of sulphate of iron to acidified sample. A precipitate will indicate gold if the bath is clean.

(3021) E. H. A. asks for the process of burnishing the gilt on photograph cards. A. The gilt on card mounts is put on by first using a size, then the gold leaf is applied and rubbed or brushed over with a thin solution of albumen; when dry, this is burnished with an agate or bone tool.

(3022) A. K. C. asks how to melt or dissolve old rubber that has been used and out of shape, so as to recast. Would a mould of plaster Paris answer? Would the article be smooth and not sticky? A. You cannot melt or dissolve old rubber. It can be worked up by mastication with fresh gum. It can be shaped to a certain extent only by pressure and heat. If once melted, it will not again solidify. In "Rubber Hand Stamps and the Manipulation of India Rubber," $1 by mail, you will find the whole subject treated.

(3023) L. D. N. asks how to repair a looking glass where the coating has seemed to have parted or has been removed in spots. A. From a small piece of old looking glass scrape off all the silvering except what will suffice to cover the spot and cap over on all sides. Place a drop of mercury on the silvering thus isolated. This will soften it so that it can be pushed off and dropped upon the defective place. The result will probably be imperfect. Possibly the mirror has a true silver surface. If so, the replating cannot be thus effected. An alkaline solution of silver nitrate with a reducing agent may be used, but success with a really bad mirror would be very doubtful. See query 1944.

(3024) J. C. G. asks for a composition for silver plating by the dipping process. A. Any plating solution of silver can be used. An ammoniacal solution of nitrate of silver with some whiting in suspension is available. The plating produced is very inferior.

(3025) Subscriber asks: Can you inform me what chemical ingredients will erase ordinary writing ink from paper? A. Javelle water or a mixture of oxalic and tartaric acids in equal quantity dissolved in water.

(3026) J. W. asks how to clean tarnished gold and silver lace. A. Brush away all the dust, then brush with rock alum which has been burned, crushed, and sifted through a lawn sieve. This will remove the tarnish.

(3027) A. M. T. asks how to pickle mushrooms. A. Wash the mushrooms with water, wipe them with flannel and put them in brine and boil. After boiling for a few minutes drain in a callender and spread out on a linen cloth to dry. Place in bottles, add a little mace and fill up the bottle with white vinegar. Pour some melted mutton fat on the top before corking and seal with bottle wax.

(3028) G. F. S. asks: 1. Is water porous? A. Not in the mechanical sense. It has physical or molecular pores. 2. Can you reduce the bulk of water by pressure? A. Yes.

(3029) E. S. D. asks: Will you kindly (through columns of SCIENTIFIC AMERICAN) give a receipt for a preparation suitable for removing wood stains from the hands of wood turners? Would like to know of some chemical or preparation which would permanently remove such stains. A. We would suggest javelle water. Borax would also be advantageous used in strong aqueous solution.

(3030) F. C. K. asks for some salt or other chemical which is soluble in milk, and that would have no effect on it while cool, but that would have an acid reaction when heated that would coagulate the milk without changing its color or making it poisonous. A. Sulphate of ammonia becomes acid on boiling and might answer your requirements.

NEW BOOKS AND PUBLICATIONS.

ARTISTIC HOMES, in city and in country, with other examples of domestic architecture. By Albert W. Fuller and William Arthur Wheeler. Boston: Ticknor & Co. 1891. 70 plates. Price $6.

This very elegant work presents a series of photogravures of houses, of public buildings, railroad stations, high schools, etc., in various parts of the country. Of each building the exterior view with plans, as a rule, is given. The execution of the work leaves nothing to be desired, and the uncommented-on illustrations tell their own story.

THE ELEMENTS OF DYNAMIC ELECTRICITY AND MAGNETISM. By Philip Atkinson, A.M., Ph.D. New York: D. Van Nostrand Company. 1891. Pp. xii, 405. Price $2.

This book, it is stated, was written for learners rather than for the learned. It includes a very convenient *resume* of the subject of current electricity, contains numerous illustrations and seems altogether to be an acceptable presentation of the subject. Electricity is now settled on a basis so far fixed that much that is written about its elements is necessarily a repetition in each book. Dr. Atkinson seems to have brought his subject well up to date. Numerous illustrations, with an excellent table of contents and index, add materially to the value of the work.

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Electric motor, W. E. Hyer 451,559
Electric motor, F. M. La Bolteau 451,972
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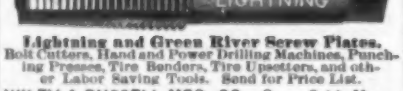

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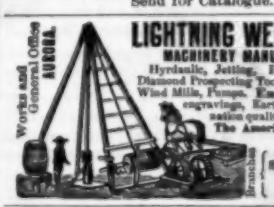

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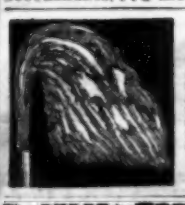

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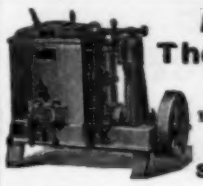

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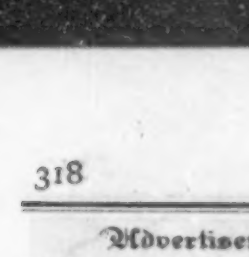

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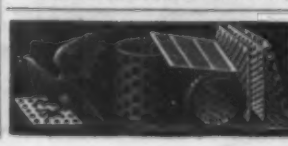

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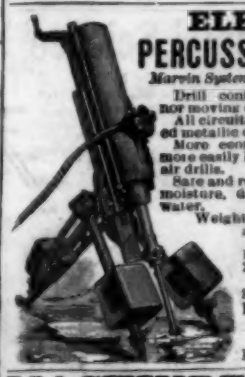

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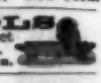

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